Public Perceptions of Elk and Vegetation Management in Rocky Mountain National Park, Colorado

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Executive Summary

This report presents results of a cooperative study between Colorado State University and the National Park Service, Rocky Mountain National Park (RMNP) that investigated the publics' preferences for elk and vegetation management in RMNP.

Background

Elk that winter in RMNP are currently at the highest levels in recent history. At this time, aspen stands are not regenerating and some willow stands are hedged. Evidence suggests that this may be due, in part, to the high elk numbers. Park managers are faced with the question of whether this represents natural conditions, and what the appropriate management response to the situation is. To assist park managers in answering this question, this study assessed the publics' preference for different end states of elk and vegetation in Rocky Mountain National Park (RMNP), and the acceptability of management actions that might be implemented in the park.

Methods

Working with RMNP biologists, four end states (referred to as scenarios), which could potentially occur in the park were developed based on a combination of elk numbers and corresponding vegetation conditions. The scenarios developed are as follows.

- Scenario 1 showed current levels of elk numbers with decimated aspen and deteriorating willow.
- Scenario 2 showed current levels of elk numbers with small areas of aspen and willow intensively managed to allow regeneration.
- Scenario 3 showed a moderate elk reduction and larger areas of aspen and willow intensively managed to allow regeneration.
- Scenario 4 showed a large elk reduction and aspen and willow regeneration without intensive site management.

A mail survey instrument was developed based on photos taken in the park that were then manipulated using Microsoft Photoshop to depict the conditions of elk, aspen and willow that would result under the different scenarios. The scenarios were presented in a poster, which also contained background information on elk and vegetation in RMNP. A booklet was used in conjunction with the poster and asked questions about the scenarios and acceptability of management actions that could be applied to elk and vegetation, both in the park and in the areas surrounding the park. During the summer of 2003, the survey was administered to a sample of park visitors from Colorado, park visitors who did not reside in Colorado, the general public in Estes Park and Grand Lake, the general public in Colorado, and the general public nation-wide. The names of addresses of the park visitors were obtained during August and September 2002. The names and addresses for the general population strata were obtained from Genesys Marketing Systems Groups.

Key results

Consistent across all strata, scenarios one and two, with high elk numbers and decimated aspen and willow, had the lowest level of acceptability (ranging from 10% to 25% rating it as acceptable) and scenario three, with a moderate reduction in elk and some intensive management of aspen and willow, had the highest level of acceptability (rated as acceptable by approximately 70% to 80% of respondents). Respondents were mixed on scenario four, with a large elk reduction and areas of aspen and willow regenerating without site management; it was rated as acceptable by approximately 60% of respondents, but also rated as most opposed by one-quarter of respondents.

Respondents were also split on the acceptability of several management actions that could be implemented inside of RMNP. Methods to reduce elk numbers, such as short- and long-term contraception, using government employees to cull elk, and the reintroduction of wolves, as well as site management techniques, such as small-scale fencing on long-term basis, large-scale fencing, the protection of individual trees with chicken wire, and the protection of individual trees and shrubs with log and rock barriers, were rated as acceptable by approximately half to sixty percent of respondents. Hazing elk with rubber bullets or loud noises and the protection of individual trees with chemicals had a low level of acceptability (approximately 20% to 30%). Management actions to improve habitat, including prescribed burning, restoring beavers, and installing artificial dams to create wetlands, had the highest level of acceptability (approximately 70% to 80%).

General questions regarding elk and vegetation management indicated a majority of respondents were willing to accept decreased elk numbers if natural conditions dictated, even if it meant diminished viewing opportunities. Across the strata, approximately 90% of respondents agreed with the statement "If natural conditions dictate there should be fewer elk in the Park, the elk herd should be reduced," whereas 15% to 20% respondents agreed with the statement "It is important to maximize elk viewing, even if it results in a loss of vegetation on the elk winter concentration area." Approximately 9 out of 10 respondents in these strata agreed with the statement "It is acceptable to reduce the size of the elk herd to ensure that aspen and willow regenerate."

Table of Contents

List of Tables

List of Figures

BACKGROUND OF STUDY OBJECTIVES

Resource managers at Rocky Mountain National Park are currently undergoing a planning process to address concerns over impacts elk that winter in the park are having on their winter range vegetation. Elk that winter in the park are at their highest levels in recent history. A variety of factors have been suggested as the catalyst for the high elk numbers, including eradication of the wolf and the elimination of hunting in the park. Concurrent with the historic high elk populations, evidence suggests the majority of aspen stands on the elk winter range are not regenerating (Suzuki, Suzuki, Binkley, and Stohlgren, 1999). Baker, Munroe, and Hessl (1997) reported that only 10% of aspen stands in RMNP contained a cohort that successfully established in the past 30 years. In addition, willow in RMNP are hedged and noticeably short on the winter range (Singer, Zeigenfuss, Cates, and Barnett, 1998). Several researchers have focused on the reasons behind this decline in aspen and willow in RMNP. Many of these researchers have found a strong correlation between elk numbers and the lack of regeneration of aspen (White, Olmsted, & Kay, 1998; Baker et al., 1997; Suzuki et al., 1999). Singer et al. (1998) concluded that the high level of elk in the park is at least in part responsible for the decline of willow in RMNP.

A critical question that forms the basis for the management plan revolves around if the current high elk numbers represent natural conditions or if natural conditions suggest the elk herd should be reduced. If the cause of the lack of regeneration of aspen stands and the decline of willow is due to high elk populations, and judged to not represent natural conditions, steps can be taken to reduce the impacts of the elk. There are many management strategies that could be employed in this pursuit, one of which would be to reduce the number of elk in the park. This could be achieved through directly culling the herd or through contraception. Another strategy would be to use barriers such as fencing, or chemical repellants to prevent elk from browsing on aspen stands and willow, thereby, dispersing elk on the winter range. Additionally, steps could be taken to move elk away from areas of high impact. This might include such actions as hazing elk away from vegetation through the use of loud noises, or even moving them away by using herding dogs such as border collies. Further potential actions such as restoring beavers or constructing artificial dams could be implemented in order to create wetlands in sensitive vegetation areas and stimulate vegetative growth. While these different management alternatives might be equally effective in achieving vegetation objectives, they may have different levels of acceptance by the public.

To gauge the public's preference for different tradeoffs between vegetation and elk (e.g., sustained elk populations at current or near-current levels versus regenerating aspen and willow) we developed a study that explored acceptability of these tradeoffs. Because a written description of the tradeoffs would be too complex and abstract for most respondents, a survey instrument was developed that used visual stimuli (e.g., actual photographs and / or manipulations of these actual photographs) to depict the tradeoffs. The survey instrument also assessed the respondents' acceptability of control techniques that could be implemented by park managers.

SURVEY INSTRUMENT

The survey instrument developed for this study used visual stimuli (photographs) to represent conditions that are predicted to result under different management alternatives. The visual stimuli photographs (and / or manipulation of these photographs) represent vegetative conditions under different management alternatives. Previous research has explored the degree of validity and reliability of surveys that use a visual approach, as well as methodology for selection of the photographs. Some themes emerging from studies examining these issues include strong correlations between responses to visual representation of on-site conditions with the same questions asked on-site and different methods measuring similar constructs. Additionally, many researchers have found high reliability among responses. A discussion of some of these findings follows.

Previous Research on Visual-Based Survey Instruments

The Scenic Beauty Estimation (SBE) applied psychometric measurement concepts to measure the scenic beauty of forest landscapes exhibiting different characteristics through the use of color slides (Daniel and Boster, 1976). Examinations of the reliability and validity of SBE have supported the use of photo-based ratings as a proxy for on-site ratings (Daniel and Boster, 1976; Brown, Richards, Daniel, and King, 1989). Scenic beauty estimations have also been compared to willingness to pay (WTP) for campgrounds (Daniel, Brown, King, Richards, and Stewart, 1989), to compare preferences for landscapes managed by the National Park Service and US Forest Service in southern Utah (Clay and Daniel, 2000), and to examine perception of scenic beauty and recreation acceptability of forests that had been burned in the recent past (Taylor and Daniel, 1982). Results of these studies support convergent validity of SBE estimates.

In addition to SBE, there has been research conducted to assess the validity and reliability of visual stimuli in survey instruments outside of the SBE research area. Some of these studies are highlighted below.

Palmer and Lankhorst (1998) evaluated respondents' ratings of different aspects of landscapes. In the psychology field, Wang & Markham (1999) have used pictures to evaluate facial expressions based on photographs that represent an emotion in question.

Visual stimuli have been applied in normative studies in the recreation and tourism field. In these studies photographs, or simulations, are used to represent the different conditions in question. The conditions may be densities of people, different levels of physical impacts, or development at the site. Manning, Valliere, Wang, and Jacobi (1999), for example, used a visual approach to study crowding norms on carriage roads at Arcadia National Park. Freimund, Vaske, Donnelly, and Miller (2002) measured normative acceptability of a variety of conditions in Gwaii Hannas National Park Reserve in British Columbia.

Differences and Similarities Between Previous Research and the Present Study

One note to make about the SBE rating method is that the respondents were presented with each slide one at a time for about 8 seconds. There was no chance for the respondents to go back and change their ratings. This differs slightly from the methods used in this study. As will be highlighted, we conducted a mail survey. This gave respondents a chance to go back and change answers as different information was presented. However, the extent that this occurred or affected results is not known.

In SBE method, the photographs were taken from random directions once the area (e.g., starting point) was selected. While some SBE studies required areas that represented specific conditions (e.g., Taylor and Daniel), the photographs were still randomly taken. In the present study, the photographs could not be randomly taken from a designated starting point. It was required that the photographs be purposively taken so that specific scenes were represented, (i.e., a meadow showing the entire aspen stand or willow grove).

DEVELOPMENT OF INSTRUMENT

To develop the survey instrument we employed a combination the methods used by previous researchers in this area. The first step in developing the instrument was to identify the current conditions of the elk winter range. Based on these conditions and on biological modeling conducted for Rocky Mountain National Park, four future scenarios were proposed that could hypothetically exist given a certain level of elk population, coupled with varying levels of management. These are referred to throughout this report as hypothetical future scenarios or as end states.

The first end state was suggested to result under a situation of no direct management. In other words, the elk population would remain at its current level and there would be no management actions implemented that would be designed to intentionally affect either the elk or the vegetation. The conditions hypothesized to result in this scenario would be expected to occur in approximately 50 to 100 years. They include a continuing decline of aspen with a likelihood of eventual disappearance, along with a lack of willow shrub restoration on the elk winter range and possible continuing decline of this species. It was also suggested that habitat for animal species other than elk and, therefore, biodiversity would be substantially reduced from its current levels.

The other three hypothetical future end states put forth were approximated to occur in 25 to 50 years. The second future scenario was similar to the first in that the elk population would remain at its current level. A difference in this scenario was that small portions of some aspen stands and willow on the elk winter range would be intensively protected. Those areas of vegetation that were not intensively protected would continue to decline, resulting in conditions as described in the previous scenario. Following logically, the areas of intensively protected vegetation would maintain more biodiversity and potential habitat than those areas that were not protected.

The third hypothetical future scenario employed management or reduction methods that would directly impact the elk. The size of the herd would be approximately 60 percent of its current size. Concurrently, there would be intensive protection of more and larger areas of aspen and willow. As in Scenario 2, those areas of aspen and willow that were not intensively protected would eventually disappear. Maintenance of habitat for a diversity of species would be maintained at a high level.

The final end state involves a larger reduction in the elk herd (reduced to approximately 30 percent of it current size) but a more moderate level of site protection. Given the size of the elk herd in this situation, while some protection of aspen and willow would be needed initially, they would likely reach a point at which no site protection was needed in order for their regeneration. Following the above trends, habitat for other species as well as biodiversity on the elk winter range would increase over its current levels.

Upon generation of these scenarios, representations of aspen trees and willow shrubs were created using actual photographs of the park manipulated with the computer program Photoshop. A large bank of photographs from which to develop the hypothetical scenarios was developed in consultation with Park biologists. The photographs were taken in early fall 1999 with care taken to ensure the photographs were taken with similar lighting conditions and stages of changing foliage.

Final Instrument

The final instrument was designed to be administered by mail and consisted of 1) a poster displaying background information, a description of the hypothetical scenarios, and the visual depiction of the scenarios and 2) a booklet with instruction, Office of Management and Budget approval/privacy information, and spots to record the answers.

Poster

The poster was 25" x 18", printed in color, and consisted of background information regarding the history and accepted facts regarding elk and vegetation in the Park and the surrounding area. Each hypothetical scenario was depicted in a row that used bulleted information and pictures to describe the scenario. Three pictures were used per management scenario; one which represented the number of elk present, another which depicted hypothetical conditions of aspen trees, and a picture which depicted hypothetical conditions of willow shrubs. As discussed previously, these pictures represented the hypothetical future scenarios given a corresponding level of elk population that were based on, although not representing exactly, models that were developed to examine the relationship between elk and vegetation in the RMNP area. Descriptions of the scenarios follow:

- Scenario 1 showed current levels of elk numbers with decimated aspen and deteriorating willow.
- Scenario 2 showed current levels of elk numbers with small areas of aspen and willow intensively managed to allow regeneration.
- Scenario 3 showed a moderate elk reduction and larger areas of aspen and willow intensively managed to allow regeneration.
- Scenario 4 showed a large elk reduction and aspen and willow regeneration without intensive site management.

Booklet

The booklet listed the instructions for the survey. The first task was to read through background information regarding elk and vegetation in the park and then to examine the 4 hypothetical scenarios. After reading through the background information, respondents were prompted to rate the overall acceptability of each management scenario. In addition, respondents were asked some of the reasons for their acceptability of each of the future scenarios in an open-ended question format. Next, they were asked which hypothetical future scenario they most preferred as well as which scenario they most opposed. After evaluating each hypothetical future scenario, the respondents were asked about their acceptance of different management actions to achieve future end states (i.e. the conditions of aspen trees and willow shrubs with the corresponding management scenario). A short narrative introduced the idea that possible actions for elk and vegetation management, both inside RMNP and in areas surrounding the Park, may be taken through a variety of methods, and that some techniques may need to be applied in conjunction with one another to be effective. A brief description of each management technique, including its advantages and disadvantages, was provided. The respondents were asked to rate the acceptability of seventeen management actions that could be used in RMNP and sixteen actions that could be used in areas outside of RMNP. Management actions included variations of fencing, herd reduction methods, hazing techniques, and habitat improvement. See Appendix D for a complete listing of management actions.

In addition to rating the hypothetical end states and acceptability of specific management actions, we asked respondents to rate their level of agreement with some general wildlife questions. The first set of questions regarded elk and vegetation management in RMNP. They referred generally to the importance of the size of the elk herd and wildlife viewing. The second set of questions was designed to measure respondents' values towards wildlife. These will be discussed in more detail later in this report.

Finally, there were questions that did not necessarily directly relate to the management of elk and vegetation in RMNP, but did attempt to garner information about respondents' trips to the Park. We asked respondents to identify how many times in the past 12 months they had visited RMNP, or if they had never visited the Park. For those who had previously visited the Park, they were asked to identify where in the Park they had visited. This was done by including a map outlining the perimeters of RMNP in the survey booklet. Some of the more popular destinations in the Park (e.g. Bear Lake, Trail Ridge Road) were placed on the map and respondents were asked to circle the areas that they had visited on their most recent trip to RMNP. They were also asked, in

an open ended format, to list other areas they had visited on their most recent trip. Activities participated in while visiting RMNP were also addressed. A range of activities that could be done while at the Park were listed (e.g. hiking, fishing, auto touring) and respondents were asked to check off all they had participated in while visiting RMNP. Similarly to the question about places visited, respondents were prompted to write in other activities that were not listed that they had participated in while visiting RMNP. They were asked how important wildlife viewing was relative to other aspects of their visit via a ranking from much less important to much more important. And related to wildlife viewing, respondents were asked about characteristics that described their wildlife viewing patterns (more specific information on this question is covered later), and lastly, some general demographic information was gathered.

ADMINISTRATION OF INSTRUMENT

Sample

The names and addresses of visitors were gathered through an onsite survey conducted during August and September, 2002. For the sample of visitors, data were gathered through a multi-stage cluster sample. Prior to conducting the onsite survey, time intervals and entrance stations were randomly selected. The first phase of visitor sample consisted of sampling cars exiting the park at one of the three main entrance stations (chosen from Fall River, Beaver Meadows, and Grand Lake) during the randomly chosen time blocks. Two times blocks (morning and evening) were used for August and an afternoon time block used for September. As people exited the park, their cars were pulled over at random time intervals. This resulted in 276 possible time blocks. Using the following formula from Scheaffer, Mendenhall, and Ott (1990, p. 69) and assuming a range of cars of 3000, it was determined that 74 time blocks were required to sample cars to within +/- 5% of the mean value of cars for that day.

$$n = N\sigma^2 / (N\text{-}1)D + \sigma^2$$

Where σ^2 is the population variance and D = bound on the error^2 / $4N^2$

Cars were pulled over at a five minute time intervals, with the starting point randomly selected each day. The person in the car with the most recent birthday was asked if they would be willing to participate in the larger mail survey, and the names and addresses gathered of those who responded “yes”.

From this database, a random sample of both visitors who were Colorado residents and those who were non-resident visitors was selected. This sample was then administered the survey via mail. After two weeks a reminder postcard was sent to those who did not respond and after 3 weeks another survey was sent to those who still did not respond. The goal was to obtain 400 completed surveys from resident visitors and 400 completes from non-resident visitors.

In addition to RMNP visitors, three general population samples were included in the mail survey. Samples for these groups were purchased from Genesys Marketing Systems Groups, and were

comprised of residents of the general population of the towns surrounding RMNP (Estes Park and Grand Lake), residents of the general population of Colorado, and the general population nation-wide. The survey administration techniques listed above were also used for these strata.

Non-Response Check

A non-response check was conducted for those people who did not respond and for which a survey was not returned as undeliverable. The non-response check was conducted by telephone survey techniques, and consisted of two questions that were included in the mail survey and intended to measure respondents' wildlife value orientations. The two questions were "Humans should manage wild animal populations so that humans benefit", and "Animals should have rights similar to the rights of humans." These and other questions intended to measure values toward wildlife were adapted from previous studies that have addressed this topic and found the questions to be a reliable measure of wildlife value orientations (Fulton, Manfredo, and Lipscomb, 1996). This allowed a test to determine if those who did not respond differed from those who did. The data can then be, and were in this case, weighted accordingly.

ANALYTICAL FRAMEWORK

The bulk of the analyses for this report were accomplished through the use of descriptive statistics. Most of the questions on the survey asked respondents about their acceptability of the aforementioned management actions. Collapsing the response categories from a 7-point scale ranging from highly acceptable to highly unacceptable with a neutral category to a 3-point scale and conducting frequencies provided a simple, yet effective summary of the data. Comparisons were made between strata (Colorado resident visitors to RMNP, non-resident visitors to RMNP, residents of Estes Park / Grand Lake, the general population of Colorado, and the general population nation-wide) within a descriptive framework of a management action using chi-square measures of association to detect differences among the groups in their responses to a given action. There was no test for differences within a stratum between different management actions. Due to the nature of the analyses that would be run to compare responses to management actions within a stratum, essentially consisting of $J(J-1)/2$ comparisons (where J is the number of management actions to be compared), type 1 error rate would compound, complicating the interpretation of results.

Inferential statistics were used to test hypothesized relationships between some of the general wildlife questions designed to measure wildlife values and the acceptability of management actions. These hypothesized relationships are based on theoretical frameworks which are discussed in detail within the results of those particular tests. In addition, we used inferential statistics to test for differences among demographic variables and acceptability of management actions.

RESULTS

Response rate

Of the 2142 cars flagged to participate in the onsite survey, 93% (1997) pulled over. Of those participants who pulled over, 37% (739) were Colorado residents, 55% (1090) were nonresident visitors, and 8% (168) were of unknown residency. Ten percent (200) of the visitors who pulled over refused to participate in the onsite survey. The mail survey was conducted during early summer 2003.

Response rates varied across the 5 strata, with the gateway towns of Estes Park and Grand Lake having the highest response rate and national residents having the lowest response rate (Table 1).

Table 1. Response Rate for Mail Survey.

	Mailed / sampled	Undeliverable	Returned	Response rate	CI[a]
National	1300	157	166	14.5%	.078
Colorado	1000	122	246	28.0%	.064
Estes Park/ Grand Lake	1000	487	292	56.9%	.059
Colorado visitors	733	36	365	52.2%	.052
Non-resident visitors	828	28	421	52.6%	.049

[a] CI = 95% confidence interval (e.g. + / - 8%).

Non-response check

A non-response check was conducted for those who did not respond to the survey and for which the survey was not returned as undeliverable (Table 2). The non-response test was conducted by telephone, and consisted of two questions designed to indicate respondents' values toward wildlife:

1. Humans should manage wild animal populations so that humans benefit.
2. Animals should have rights similar to the rights of humans.

In addition, due to the high incidence of undeliverable addresses in the Estes Park / Grand Lake stratum, a sample of those who did not receive the survey (i.e., the survey was returned as undeliverable) were called and asked the two non-response questions (Table 2).

Looking across all strata, the results of the non-response test showed some differences between respondents and non-respondents (Table 3). However, while examining the differences by strata, the differences are significant (Table 4), but an examination of the frequencies revealed no practical significances (Appendix D). The test between the respondents and those with an undeliverable address did not reveal differences between the groups (Table 5). Even though non-response bias does not appear to be a large concern, the data were weighted and analyzed by both non-response questions and by the undeliverable test for Estes Park / Grand Lake. The data

presented in this document were weighted by the non-response question "Humans should manage wild animal populations so that humans benefit". See Appendix A for results of unweighted data.

Table 2. Response Rates for Non-response Bias Test

	Attempted to call	Refused	Responded	Response rate	CI [b]
National	409	141	91	28.7%	.105
Colorado	200	33	70	52.4%	.120
Estes Park / Grand Lake [a]	227	30	54	38.8%	.136
Colorado visitors	222	16	77	53.3%	.113
Non-CO visitors	271	19	93	49.6%	.104

a. Includes both the non-response test and the undeliverable test.
b. CI = 95% confidence interval (e.g. + / - 10%).

Table 3. Results of Non-response Test

Non-response item		Respondent	Non-respondent	n	χ^2	df	Sig.	Cramer's V
				1900	28.55	2	< .001	.123
Humans should manage wild animal populations so that humans benefit	Agree	41%	47%					
	Neither	9%	15%					
	Disagree	50%	38%					
				1904	35.63	2	< .001	.137
Animals should have rights similar to the rights of humans	Agree	32%	47%					
	Neither	10%	11%					
	Disagree	58%	42%					

Table 4. Results of Non-response Test by Strata

Non-response item		n	χ^2	df	Sig.	Cramer's V
Humans should manage wild animal populations so that humans benefit	National	256	12.56	2	.002	.222
	Colorado	297	5.47	2	.065	.136
	Estes Park / Grand Lake [a]	395	4.99	2	.083	.112
	Colorado visitors	449	16.87	2	< .001	.194
	Non-resident visitors	499	14.66	2	.001	.171
Animals should have rights similar to the rights of humans	National	255	5.88	2	.053	.152
	Colorado	299	6.35	2	.042	.146
	Estes Park / Grand Lake [a]	395	10.80	2	.005	.165
	Colorado visitors	449	4.65	2	.098	.102
	Non-resident visitors	502	8.35	2	.015	.129

a. Includes both the nonresponse test and the undeliverable test.

Table 5. Results of Undeliverable Bias Test for Estes Park / Grand Lake

Undeliverable item		Respondent (EP / GL resident)	Not-received	n	χ^2	df	Sig.	Cramer's V
				100	.47	2	.792	.068
Humans should manage wild animal populations so that humans benefit	Agree	40%	35%					
	Neither	6%	9%					
	Disagree	56%	57%					
Animals should have rights similar to the rights of humans				100	.69	2	.707	.083
	Agree	41%	44%					
	Neither	17%	11%					
	Disagree	43%	46%					

Weighting for age and sex

For the national, Colorado, and Estes Park / Grand Lake sample, the distribution of males and females in the sample were compared to the percentage in the population as measured by the US Census Bureau. A pattern emerges across these data in which males and females in the younger age categories appear in lower amounts than their corresponding population values. The data were weighted to reflect population age and sex values, and weighted results compared to unweighted results. The results of the analysis did not change and therefore the results are not presented in the main body of the report. See Appendix B for results weighted by age and sex.

Presentation of results

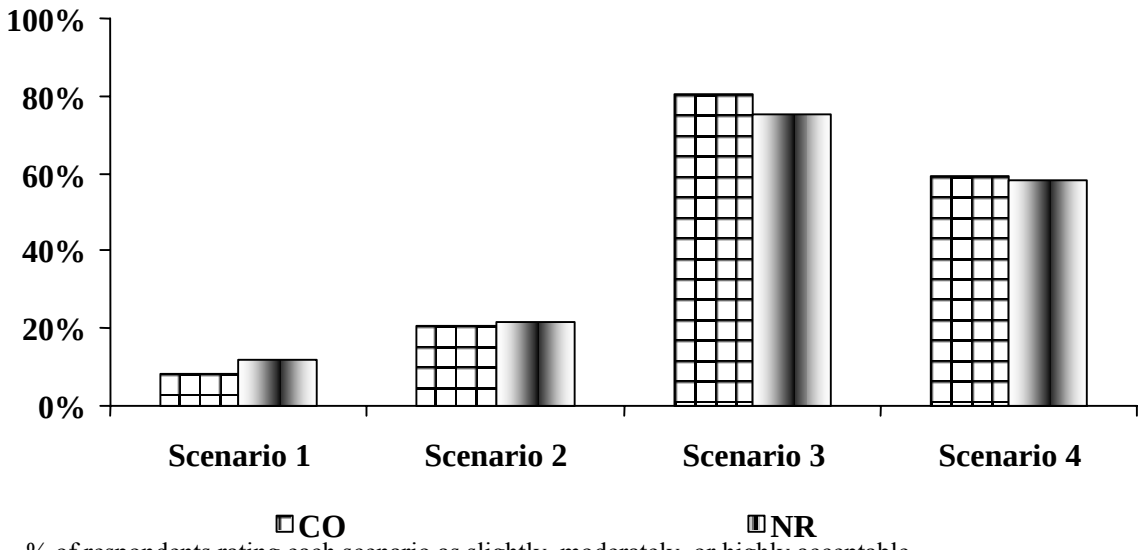
Results have been organized according to respondent stratum. Results from visitors to Rocky Mountain National Park are presented separately from results of national residents, residents of Colorado, and residents of Estes Park and Grand Lake.

Colorado Resident and Nonresident Visitor Results

Acceptability of Hypothetical Future Scenarios

Overall, Scenario 3, which maintained relatively large areas of aspen and willow with a corresponding moderate elk reduction, had the greatest level of acceptability (Figure 1).

- Scenario 4, which resulted in widespread regeneration of aspen and willow with a corresponding large reduction in elk, was also rated acceptable by slightly more than half of respondents.
- Approximately 1 in 5 respondents found Scenario 2 acceptable and 1 out of 10 found Scenario 1 acceptable.



1. % of respondents rating each scenario as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 357 and 365 for Colorado visitors and between 389 and 395 for non-resident visitors. See Appendix D for individual n's for these 4 questions.
4. Chi values: Scenario 1, $\chi^2 = 2.95$, sig. = .23; Scenario 2, $\chi^2 = 2.31$, sig = .32; Scenario 3, $\chi^2 = 4.74$, sig. = .09; Scenario 4, $\chi^2 = .02$, sig = .99.

Figure 1. Acceptability of Hypothetical Future Scenarios of Elk and Vegetation in RMNP, Visitors.

Most preferred and most opposed alternative

Scenario 3 was the most preferred scenario, being preferred by approximately 60% respondents (Table 6). Scenario 1 was opposed by about three-quarters of respondents and Scenario 4 was rated as the most opposed scenario by roughly one-quarter of respondents.

Table 6. Most Preferred and Most Opposed Management Scenario

	Most preferred scenario [b]					Most opposed scenario [c]				
Strata [a]	n	1	2	3	4	n	1	2	3	4
Colorado visitors	357	1.8	9.0	58.8	30.4	277	75.7	1.5	.0	22.8
Non-resident visitors	391	2.8	8.7	57.4	31.1	309	72.6	1.5	.7	25.2

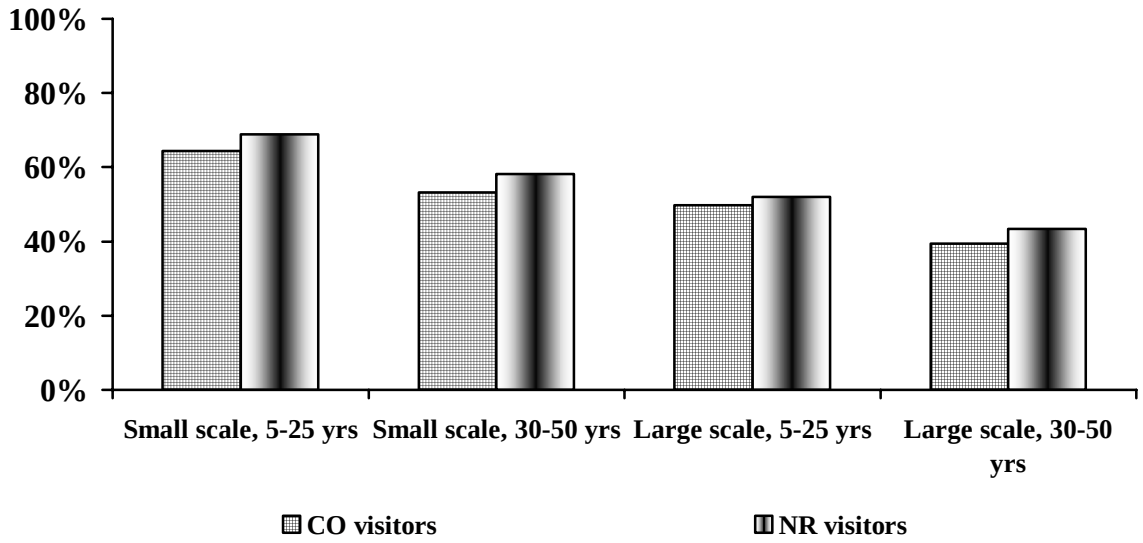
a. Data weighted by "Humans should manage wild animal populations so that humans benefit".
b. Cell entries are % selecting each scenario as the "most preferred".
c. Cell entries are % selecting each scenario as the "most opposed".

Acceptability of management actions *inside* Rocky Mountain National Park

Fencing in RMNP

In general, small-scale fencing, with a 5-25 year application, was rated with the highest level of acceptability, being rated acceptable by approximately 6 of 10 respondents (Figure 2).

- Small-scale fencing, 30-50 year application and large-scale fencing, 5-25 year application were rated acceptable by approximately half of respondents.
- Large-scale fencing with a 30-50 year application was rated acceptable by approximately 4 of 10 respondents.



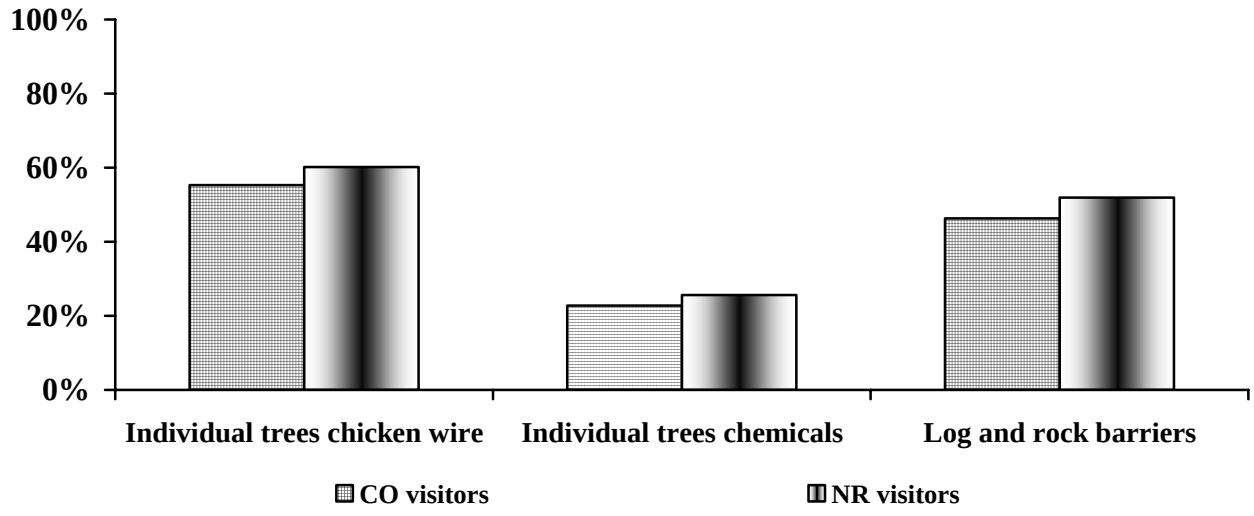
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 357 and 364 for Colorado visitors and between 385 and 388 for non-resident visitors. See Appendix D for individual n's for these 4 questions.
4. Chi values: Small-scale, 5-25, $\chi^2 = 3.10$, sig. = .21; Small-scale, 30-50, $\chi^2 = 1.91$, sig = .39; Large-scale, 5-25, $\chi^2 = .32$, sig. = .85; Large-scale 30-50, $\chi^2 = 1.21$, sig = .55.

Figure 2. Acceptability of Fencing Management Actions in RMNP, Visitors

Resource protection

Generally, protecting individual trees and shrubs with mechanical protection (e.g. chicken wire) met with the highest levels of acceptability, with approximately 55% of Colorado visitors and 60% of non-resident visitors rating it as acceptable (Figure 3).

- Creating log and rock barriers to protect individual trees from browsing was rated as acceptable by approximately 50% of the visitors in either group.
- Chemical protection of individual trees and shrubs was the least acceptable of the resource protection methods with approximately 20% of visitor respondents rating it as acceptable.



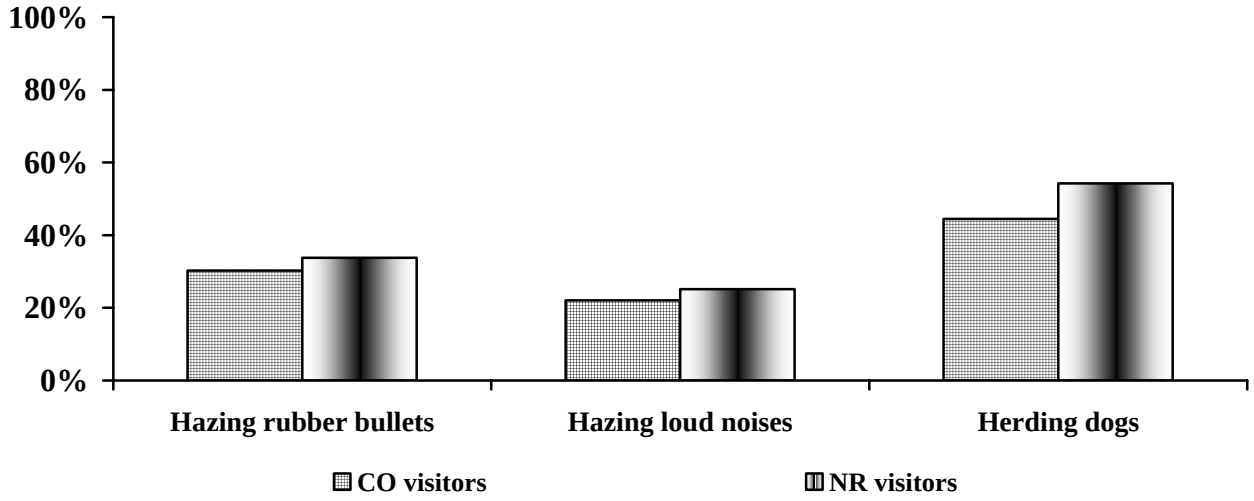
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 367 and 368 for Colorado visitors and between 401 and 403 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Chicken wire, $\chi^2 = 2.92$, sig. = .23; Chemicals, $\chi^2 = .78$, sig = .68; Barriers, $\chi^2 = 2.93$, sig. = .23.

Figure 3. Acceptability of Resource Protection Management Activities in RMNP, Visitors

Hazing techniques

Figure 4 indicates that of the hazing techniques presented, using herding dogs to move elk away from sensitive vegetation areas was the most acceptable. Approximately half of non-resident visitors found this method acceptable, while about 45% of Colorado visitors rated it similarly.

- Approximately 30% of Colorado and non-resident visitor respondents rated hazing elk with rubber bullets or rubber buckshot to be an acceptable form of management.
- Using loud noises to move elk away from sensitive vegetation was rated as acceptable by approximately 2 out of 10 respondents.

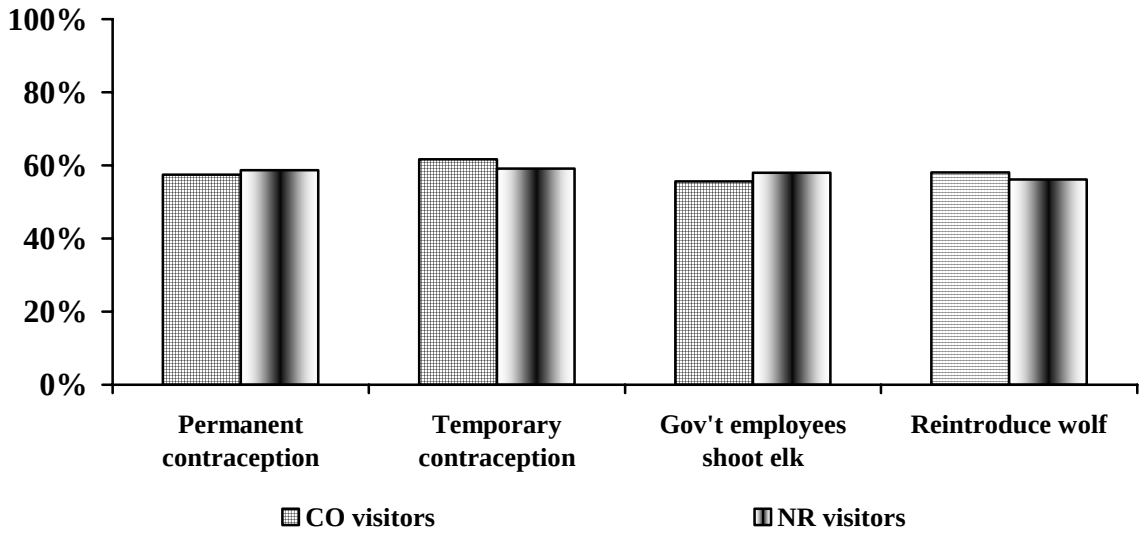


1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 362 and 367 for Colorado visitors and between 400 and 402 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Hazing with bullets, $\chi^2 = 1.44$, sig. = .49; Hazing with noise, $\chi^2 = 5.20$, sig = .07; Herding dogs, $\chi^2 = 7.76$, sig. = .02;

Figure 4. Acceptability of Hazing Techniques in RMNP, Visitors

Methods to reduce elk numbers

All management actions aimed at reducing elk numbers inside RMNP were rated as acceptable by approximately 60% of the respondents in the visitor strata (Figure 5).



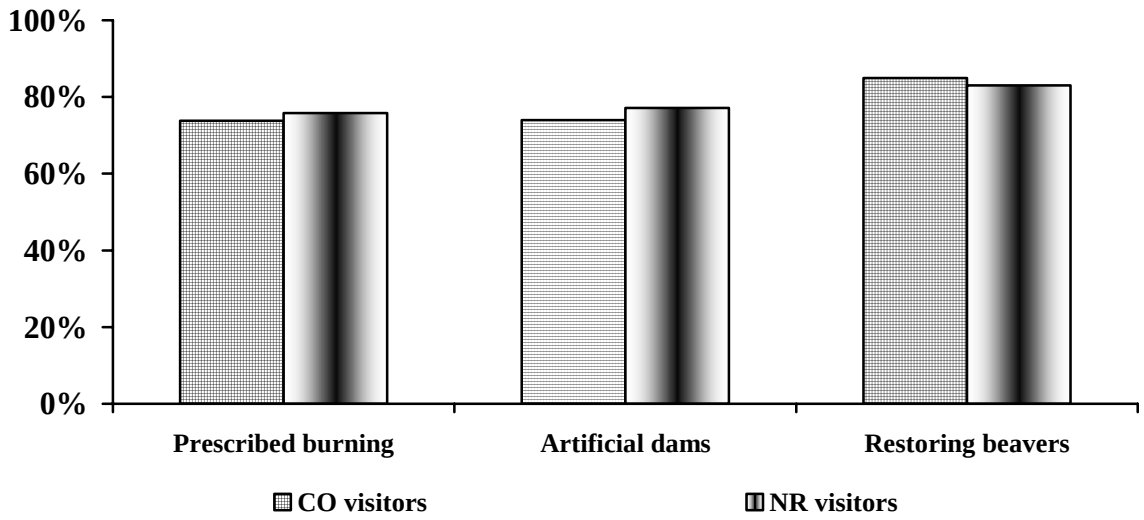
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 365 and 370 for Colorado visitors and between 401 and 404 for non-resident visitors. See Appendix D for individual n's for these 4 questions.
4. Chi values: Perm contraception, $\chi 2 = .29$, sig. = .86; Temp contraception, $\chi^2 = .80$, sig = .67; Shoot elk, $\chi^2 = .73$, sig. = .69; Reintroduce wolf, $\chi^2 = .47$, sig = .79.

Figure 5. Acceptability of Management Actions that Reduce Elk Numbers in RMNP, Visitors

Habitat improvements

Management actions that focused on habitat improvements in order to support or stimulate vegetative growth in RMNP were rated as acceptable by a majority of respondents in the two visitor strata (Figure 6).

- Restoring beavers to increase available water was rated as acceptable by approximately 8 out of 10 respondents in both groups.
- Roughly 75% of respondents in either visitor stratum evaluated using prescribed burning to promote vegetation growth inside RMNP as an acceptable management alternative.
- As with prescribed burning, approximately 75% of respondents found constructing artificial dams in wetland areas to increase available water to support willow growth to be an acceptable management action.



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 366 and 367 for Colorado visitors and between 400 and 402 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Burning, $\chi^2 = .95$, sig = .62; Dams, $\chi^2 = 1.15$, sig. = .56; Beavers, $\chi^2 = .77$, sig. = .68.

Figure 6. Acceptability of Habitat Improvement Management Actions in RMNP, Visitors

Potential Conflict Index for Management Actions in Rocky Mountain National Park
Visitor Strata

This section of the summary presents data analyzed by a technique called the potential for conflict index (PCI), with the results graphically displayed by a bubble graph (see Manfredo, Vaske, and Teel (2003) for a more detailed discussion of the PCI; the PCI calculations are shown below). The potential conflict index is represented by a number, ranging from 0 to 1, based on the distribution of scores on a response scale that includes a neutral point (e.g., highly acceptable to highly unacceptable with a neutral point). The PCI is based on the difference of the ratio of scores falling on opposite sides of the neutral line, and accounts for how far from the neutral point the scores fall.

$$PCI = \left[1 - \left| \frac{\sum_{i=1}^{n_a} |X_a|}{Xt} - \frac{\sum_{i=1}^{n_u} |X_u|}{Xt} \right| \right] * \frac{Xt}{Z}$$

where:

PCI = Potential for Conflict Index
X_a = an individual's "acceptable" (e.g., 1, 2, or 3) score
n_a = all individuals with acceptable scores
X_u = an individual's "unacceptable" (e.g., -1, -2, or -3) score
n_u = all individuals with unacceptable scores

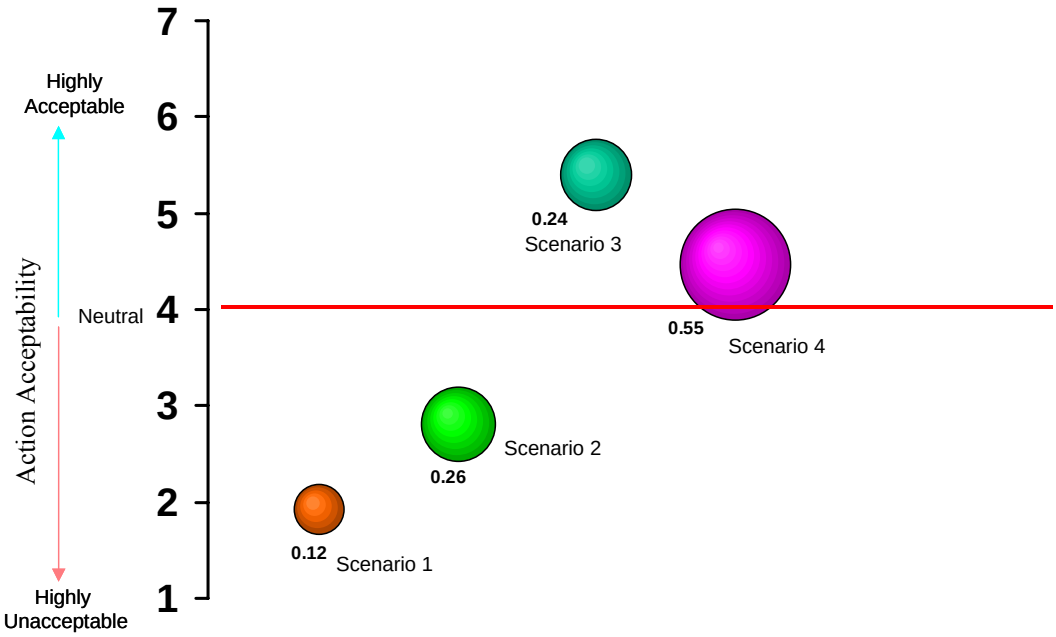
$$Xt = \sum_{i=1}^{n_a} |X_a| + \sum_{i=1}^{n_u} |X_u|$$

Z = the maximum possible sum of all scores = *n*extreme score* (e.g., $Z = 3n$), where n = total number of subjects

A PCI of zero indicates the least potential for conflict (e.g., 100% of respondents falling on one side of the neutral line) and a PCI of 1 indicates the maximum potential for conflict (e.g., 50% responding highly acceptable and 50% responding highly unacceptable). The bubble graphs displays several pieces of information:

- The center of the bubble plots the mean response of the item (e.g., management action) along the Y axis,
- The size of the bubble indicates the dispersion of the responses; the larger the bubble the greater the potential for conflict,
- The position of the bubble relative to the neutral line indicates the skewness of the data, and
- The PCI is provided next to each item's bubble (Manfredo, Vaske, & Teel, 2003).

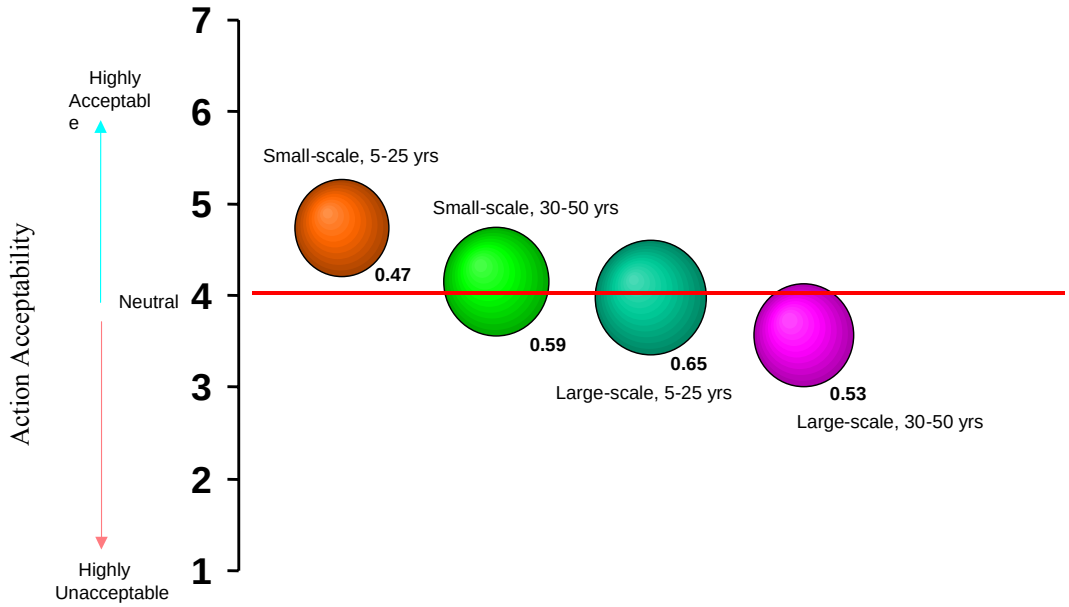
Thus, management actions with a high PCI and a large bubble indicate a high level of potential conflict, whereas management actions with a low PCI and a small corresponding bubble indicate a low level of potential conflict (assuming the implementation of the management action corresponds to the direction of mean response).



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 746 and 761. See Appendix D for individual n's for these 4 questions.

Figure 7. Potential Conflict Index for Hypothetical Future Scenarios in RMNP, Visitors

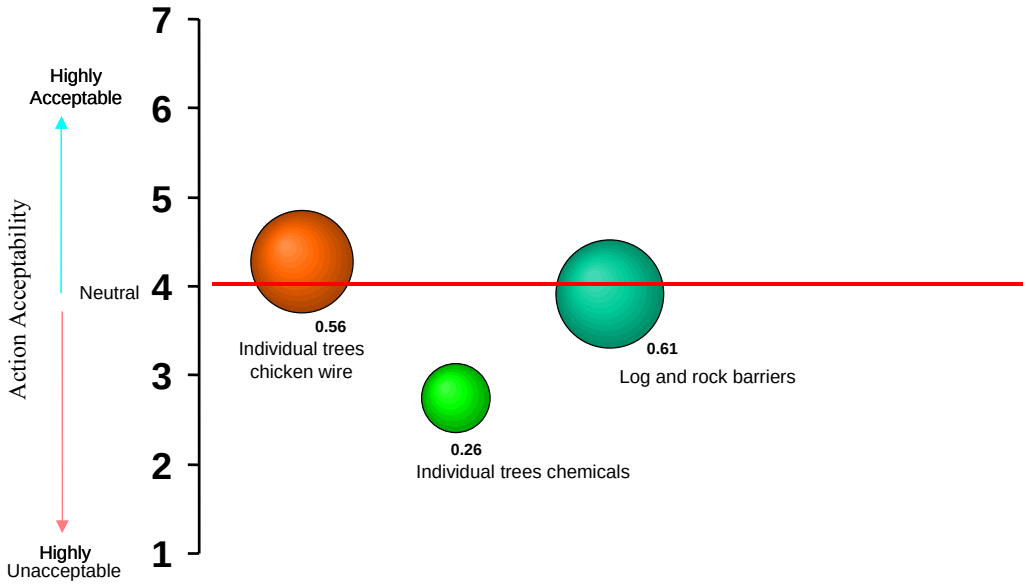
- Scenario 4 has the highest potential for conflict of the four scenarios.
- Scenario 3 falls on the acceptable side of the neutral line, and has a low potential for conflict.
- Scenarios 1 and 3 both appear on the unacceptable side of the neutral line and have low PCI's.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 741 and 752. See Appendix D for individual n's for these 4 questions.

Figure 8. Potential Conflict Index for Fencing Management Actions in RMNP, Visitors

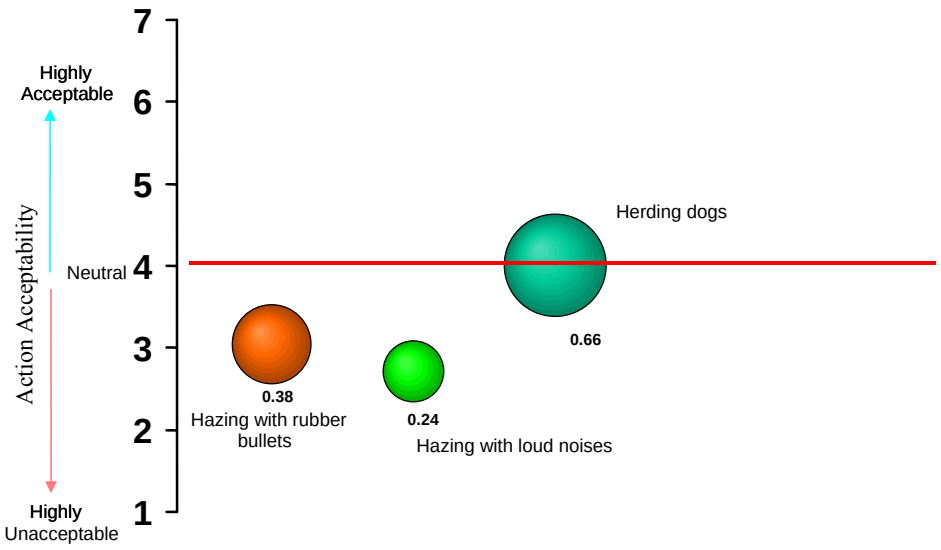
- Small scale fencing for 5-25 years has a mean on the acceptable side of neutral, but also has relatively high potential for conflict.
- The means of the other three fencing actions cluster around the neutral line and these management actions appear to have relatively high potentials for conflict.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 769 and 770. See Appendix D for individual n's for these 3 questions.

Figure 9. Potential Conflict Index for Resource Protection Management Actions in RMNP, Visitors

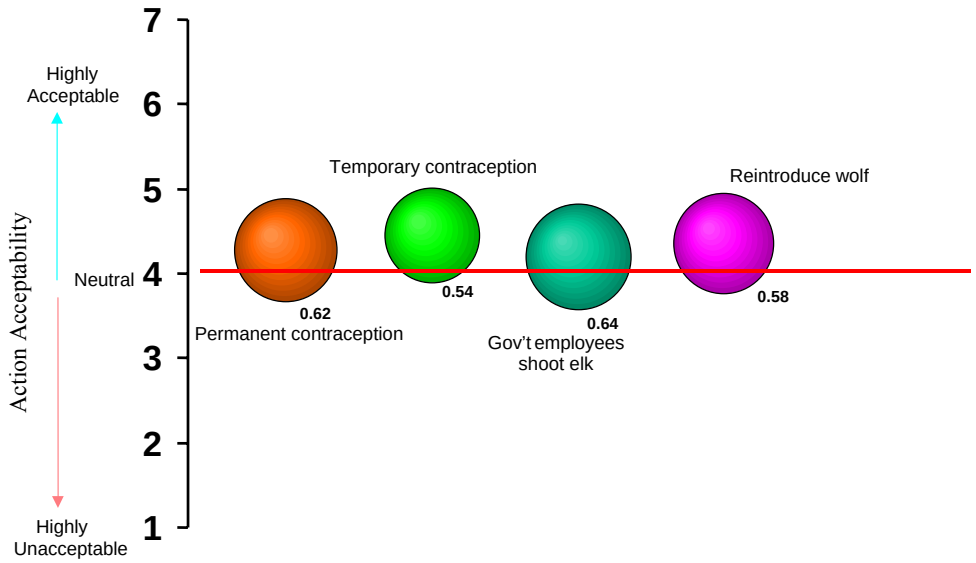
- The protection of individual trees with chicken wire and the creation of log and rock barriers to keep elk away from sensitive vegetation both straddle the neutral line, indicating potential for conflict, were they to be implemented.
- The mean acceptability of the protection of individual trees with chemicals falls on the unacceptable side of the neutral line, with some level of agreement about its unacceptability.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 762 and 768. See Appendix D for individual n's for these 3 questions.

Figure 10. Potential Conflict Index for Hazing Management Actions in RMNP, Visitors

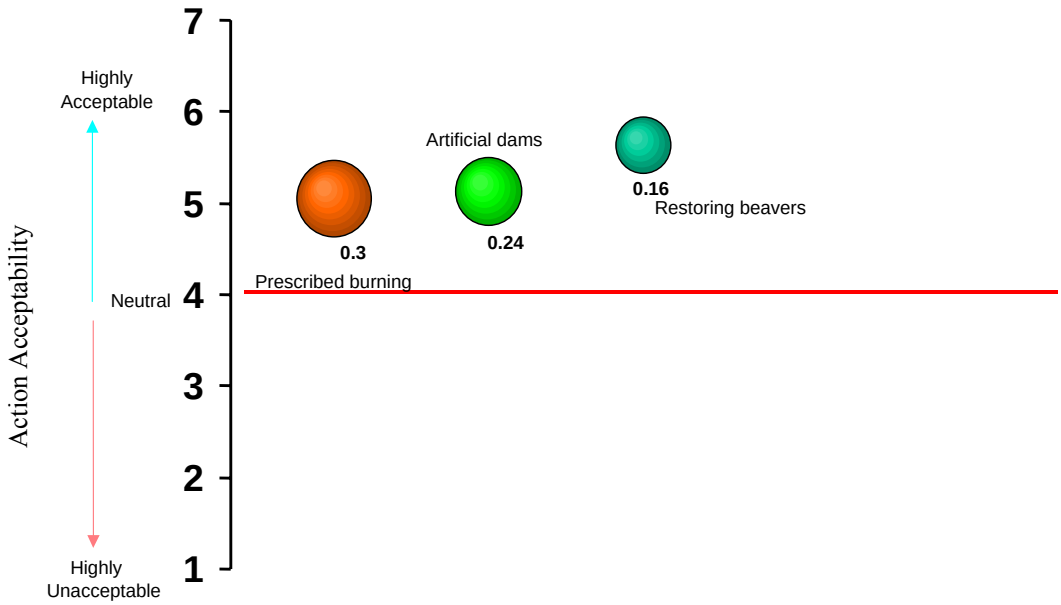
- The use of herding dogs to move elk away from sensitive vegetation areas has the highest mean acceptability of the hazing techniques, but also has the highest potential for conflict.
- The PCI's for hazing elk with rubber bullets or buckshot or with loud noises to move them away from sensitive vegetation areas indicate that there is some agreement about the unacceptability of these management alternatives.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 767 and 774. See Appendix D for individual n's for these 4 questions.

Figure 11. Potential Conflict Index for Elk Reduction Management Actions in RMNP, Visitors

- All elk reduction management alternatives have high potential for conflict, as the acceptability of these actions spans the neutral line in all instances.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 767 and 770. See Appendix D for individual n's for these 3 questions.

Figure 12. Potential Conflict Index for Habitat Improvement Management Actions in RMNP, Visitors

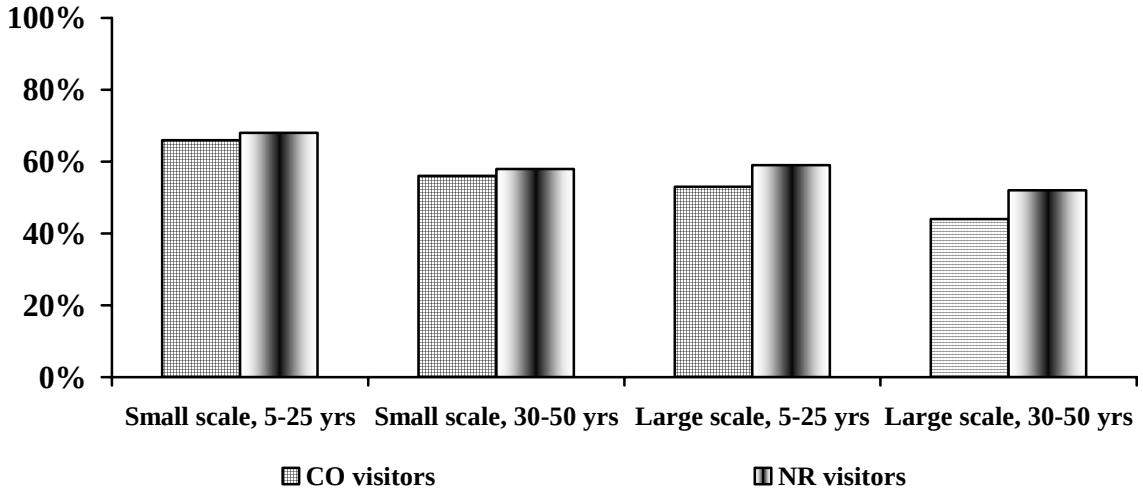
- All suggested management actions that focus on habitat improvements fall on the acceptable side of the neutral line and PCI's indicate low potential for conflict.

Acceptability of management actions *outside* Rocky Mountain National Park

Fencing outside RMNP

Small-scale fencing outside RMNP was rated as acceptable by respondents in both visitor strata (Figure 13). Generally 6 out of 10 respondents found small-scale fencing, in place for 5-25 years acceptable, and 5 out of 10 respondents found small-scale fencing, in place for 30-50 years acceptable.

- Large-scale fencing, in place for 5-25 years was rated acceptable by 5 out of 10 Colorado visitors and by 6 out of 10 non-resident visitors.
- Large-scale fencing, in place for 30-50 years was rated acceptable by 4 out of 10 Colorado visitors, and by 5 out of 10 non-resident visitors.



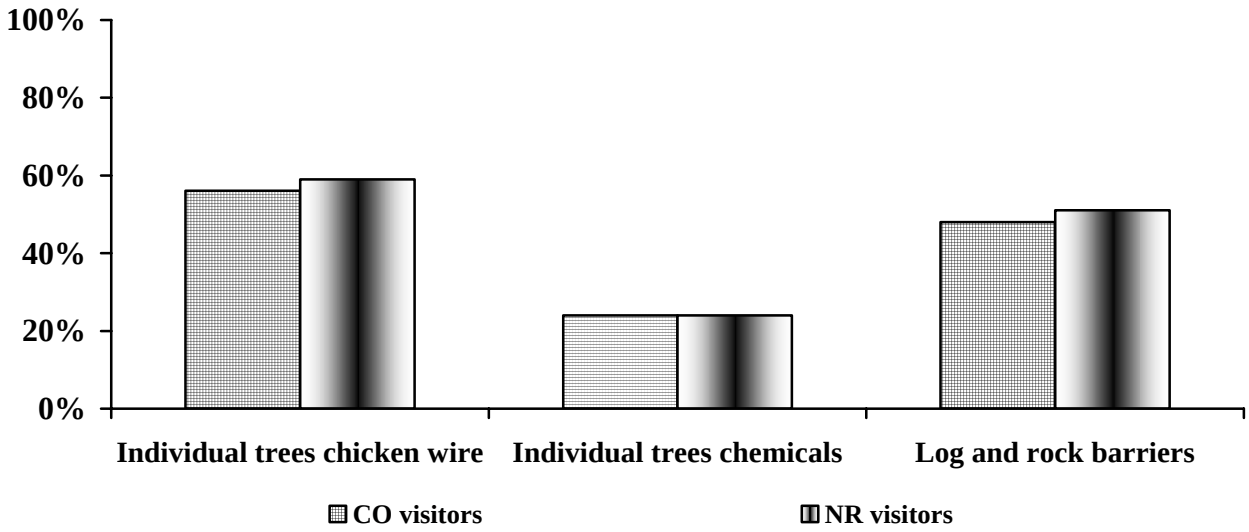
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 355 and 360 for Colorado visitors and between 385 and 388 for non-resident visitors. See Appendix D for individual n's for these 4 questions.
4. Chi values: Small scale, 5-25, $\chi^2 = 1.23$, sig. = .54; Small scale, 30-50, $\chi^2 = .83$, sig = .66; Large scale, 5-25, $\chi^2 = 3.91$, sig. = .14; Large scale 30-50, $\chi^2 = 5.15$, sig = .08.

Figure 13. Acceptability of Fencing Management Actions outside RMNP, Visitors

Resource protection

Protection of individual trees through mechanical means, such as chicken wire was the most acceptable of the resource protection management techniques, being rated as acceptable by approximately 60% of respondents in both visitor strata (Figure 14).

- Chemical protection of individual trees was the least acceptable of the resource protection management actions, as only 2 out of 10 visitor respondents found this method to be acceptable.
- Approximately half of visitor respondents in either stratum found protection of vegetation from browsing through the use of log and rock barriers to be an acceptable management action.



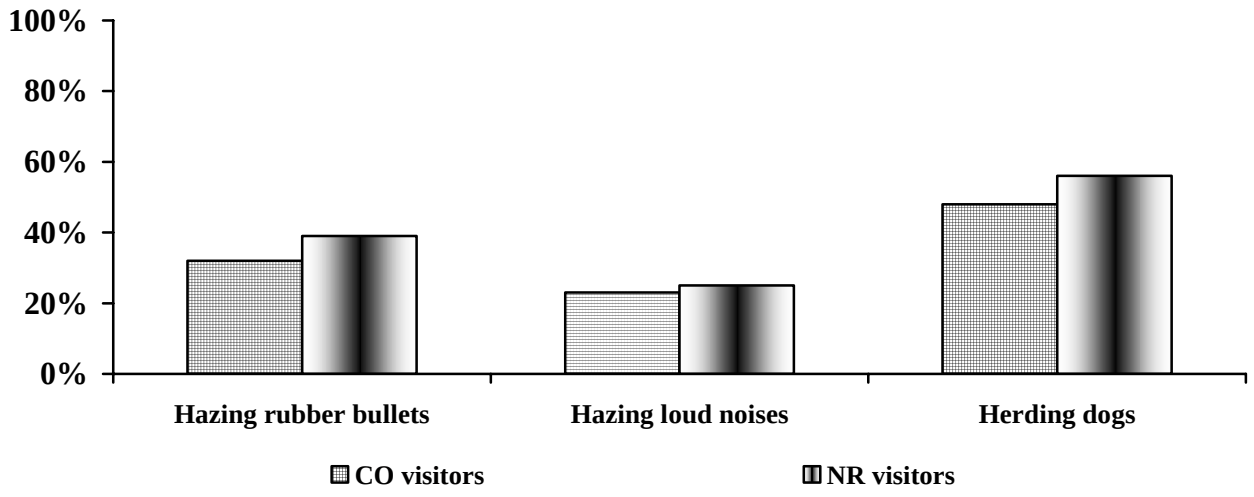
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n = 362 for Colorado visitors and ranges between 400 and 401 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Chicken wire, $\chi^2 = 1.42$, sig. = .49; Chemicals, $\chi^2 = .13$, sig = .94; Barriers, $\chi^2 = 2.03$, sig. = .36.

Figure 14. Acceptability of Resource Protection Management Activities outside RMNP, Visitors

Hazing techniques

Moving elk away from sensitive vegetation areas through the use of hazing techniques such as shooting elk with rubber bullets or buckshot or the use of loud noises was not found to be a widely acceptable management action by either visitor stratum (Figure 15).

- Shooting elk with rubber bullets or buckshot was rated as acceptable by approximately 3 out of 10 Colorado visitors and 4 out of 10 non-resident visitors.
- Only about 2 out of 10 respondents in either visitor stratum rated using loud noises to move elk away from sensitive vegetation as acceptable.
- The use of herding dogs to move elk away from sensitive vegetation areas was the most acceptable of the hazing techniques, being rated as acceptable by approximately 5 out of 10 respondents who were Colorado visitors and by approximately 6 out of 10 respondents who were non-resident visitors.



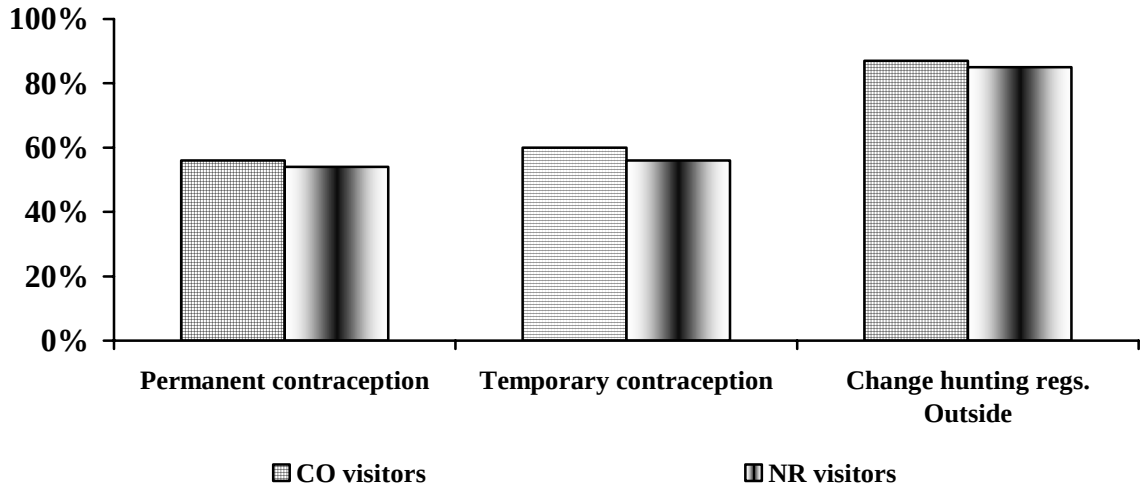
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 356 and 362 for Colorado visitors and between 399 and 400 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Hazing with guns, $\chi^2 = 6.28$, sig. = .04; Hazing with noise, $\chi^2 = 7.31$, sig. = .03; Herding dogs, $\chi^2 = 4.47$, sig = .11.

Figure 15. Acceptability of Hazing Techniques outside RMNP, Visitors

Methods to reduce elk numbers

As shown in Figure 16, changing hunting regulations outside RMNP to reduce elk numbers was the most acceptable of the elk reduction actions suggested for implementation outside RMNP, being rated as acceptable by approximately 85% of Colorado and about 90% of non-resident respondents in the visitor strata.

- The use of contraceptives outside RMNP in an effort to reduce elk numbers was generally found to be an acceptable management action.
- Permanent and temporary contraceptives were both rated as acceptable by approximately 6 out of 10 respondents.



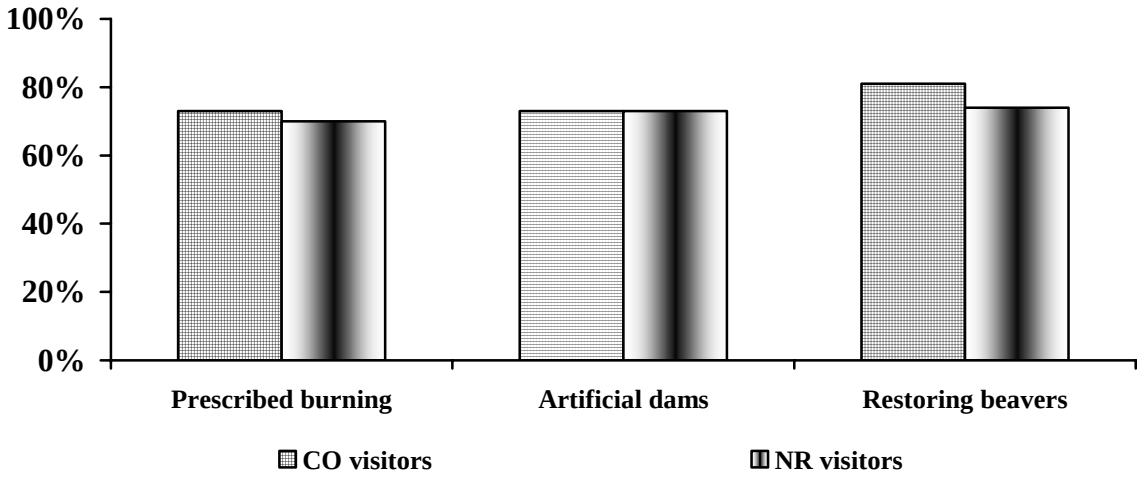
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 359 and 369 for Colorado visitors and between 400 and 404 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Perm contraception, $\chi^2 = 2.78$, sig. = .25; Temp contraception, $\chi^2 = 1.61$, sig = .45; Change hunting regs., $\chi^2 = 1.68$, sig. = .43.

Figure 16. Acceptability of Management Actions that Reduce Elk Numbers outside RMNP, Visitors

Habitat improvements

Management actions centered on habitat improvement to stimulate or support vegetative growth was evaluated as acceptable by the majority of respondents in both visitor strata (Figure 17).

- The restoration of beavers to increase water availability for willow growth was rated as the most acceptable method (8 out of 10 Colorado visitors and 7 out of 10 non-resident visitors).
- The use of prescribed burning to stimulate vegetation growth and the construction of artificial dams in wetland areas to increase water availability were both found to be acceptable management actions by approximately 7 out of 10 visitor respondents.

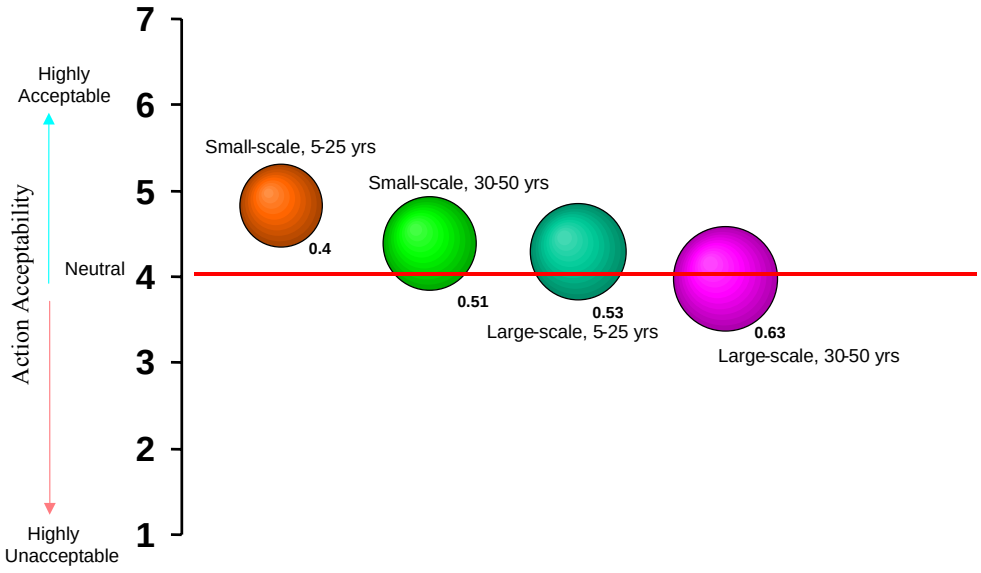


1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 359 and 362 for Colorado visitors and between 395 and 400 for non-resident visitors. See Appendix D for individual n's for these 3 questions.
4. Chi values: Prescribed burning, $\chi^2 = .68$, sig. = .71; Artificial dams, $\chi^2 = .78$, sig = .68; Beavers, $\chi^2 = 6.15$, sig. = .05.

Figure 17. Acceptability of Habitat Improvement Management Actions outside RMNP, Visitors

Potential Conflict Index for management actions *outside* Rocky Mountain National Park

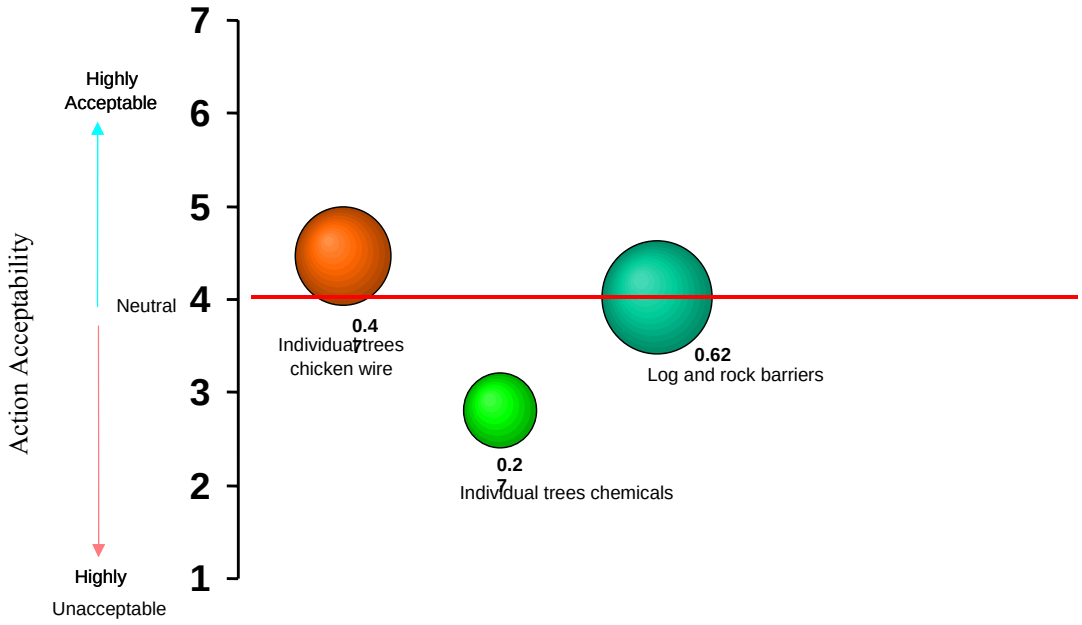
Visitor Strata



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 739 and 747. See Appendix D for individual n's for these 4 questions.

Figure 18. Potential Conflict Index for Fencing Management Actions outside RMNP, Visitors

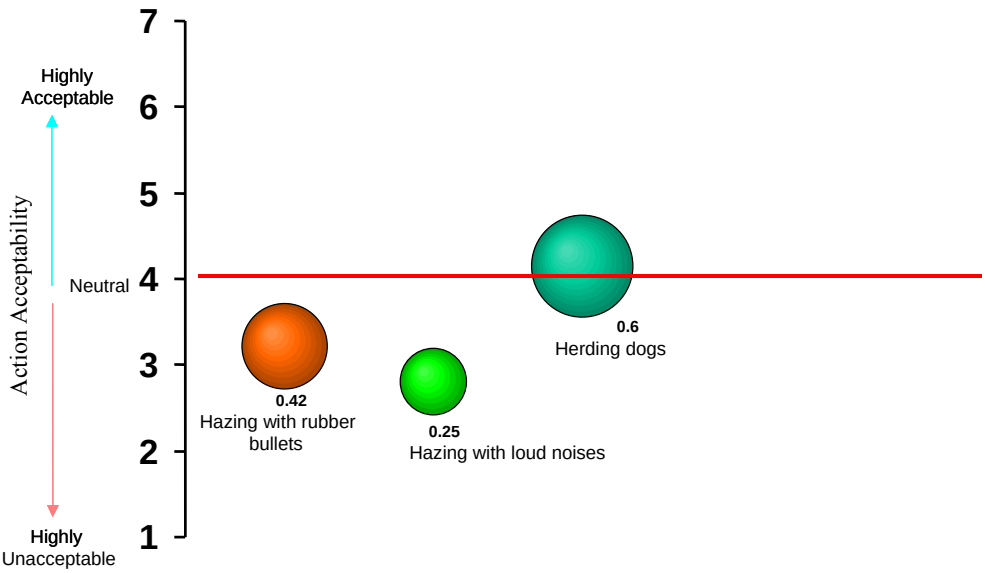
- Small-scale fencing, applied for a period of 5-25 years falls on the acceptable side of the neutral line; its PCI suggests there may be some disagreement about the degree of acceptability.
- The remaining three fencing actions have means clustered around the neutral line and PCI's that suggest potential for conflict.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n = 762

Figure 19. Potential Conflict Index for Resource Protection Management Actions outside RMNP, Visitors

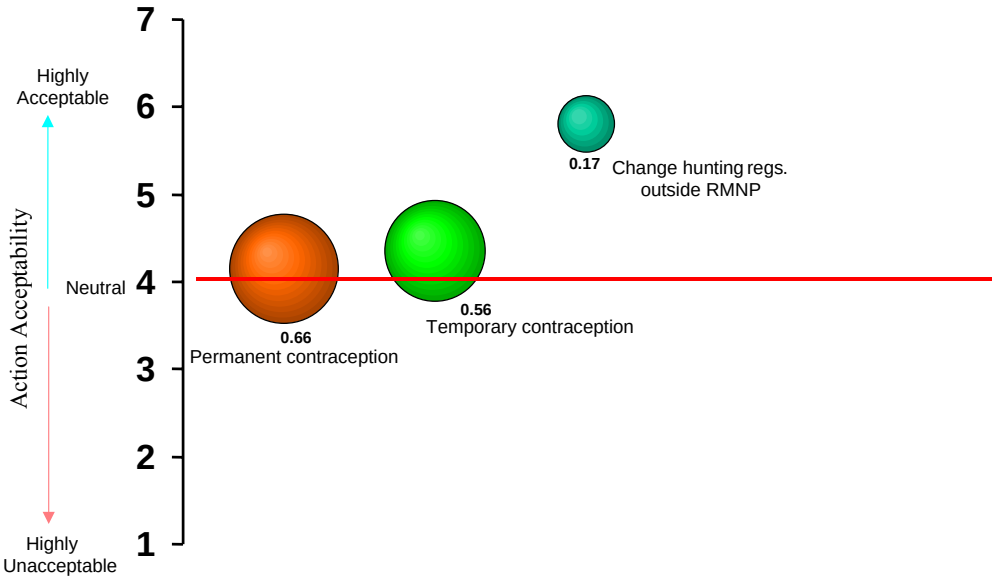
- The mean acceptability of constructing log and rock barriers to keep elk away from sensitive vegetation and the protection of individual trees with chicken wire are close to the neutral line and have potential for conflict.
- Chemical protection of individual trees is shown to be unacceptable, and has a relatively high level of agreement among visitor respondents.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 757 and 760. See Appendix D for individual n's for these 3 questions.

Figure 20. Potential Conflict Index for Hazing Management Actions outside RMNP, Visitors

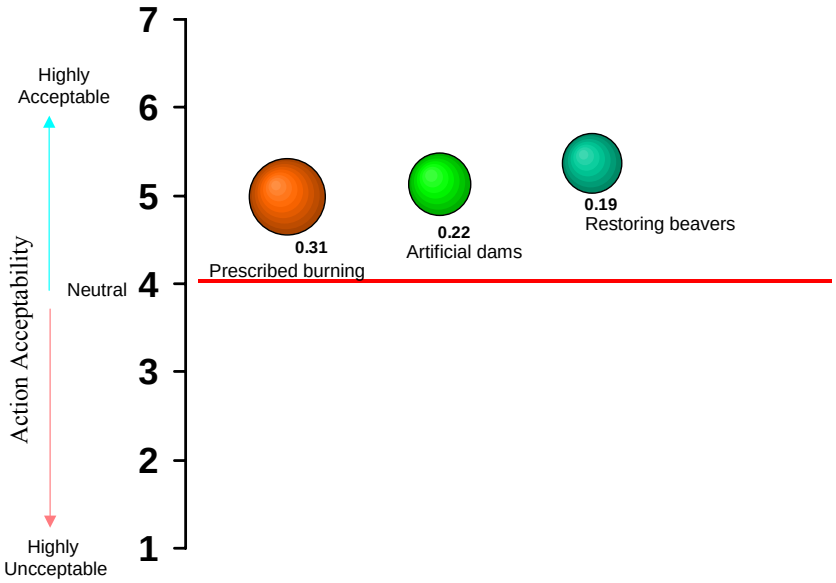
- The use of herding dogs to move elk away from sensitive vegetation areas has the highest acceptability of the hazing management techniques, but also has the highest potential for conflict.
- Both hazing elk with rubber bullets or buckshot and hazing elk with loud noises both fall on the unacceptable side of the neutral line, it appears there may be some disagreement about hazing with rubber bullets.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 761 and 772. See Appendix D for individual n's for these 3 questions.

Figure 21. Potential Conflict Index for Elk Reduction Management Actions outside RMNP, Visitors

- Of the methods to reduce elk numbers suggested for implementation outside RMNP, changing hunting regulations outside the Park was the most acceptable, with a high level of agreement.
- Both permanent and temporary contraception have relatively high potential for conflict if implemented.



1. Includes both Colorado resident and nonresident visitors.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 755 and 762. See Appendix D for individual n's for these 3 questions.

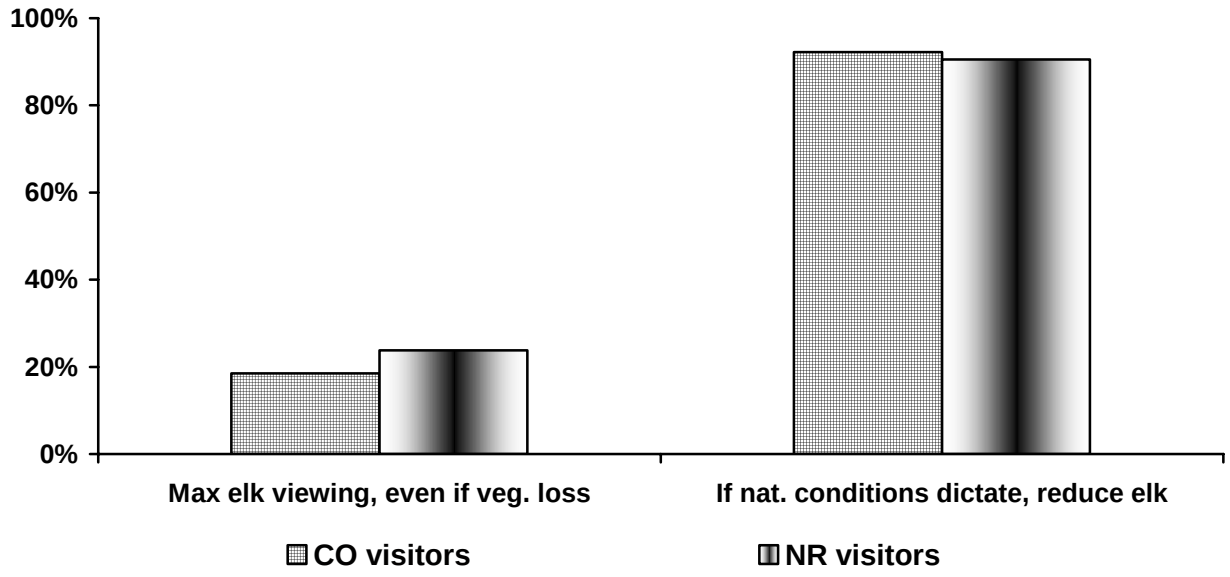
Figure 22. Potential Conflict Index for Habitat Improvement Management Actions outside RMNP, Visitors

- All habitat improvement alternatives suggested for use outside RMNP were found to be acceptable, with high levels of agreement about acceptability.

General Questions about Elk and Vegetation Management in Rocky Mountain National Park

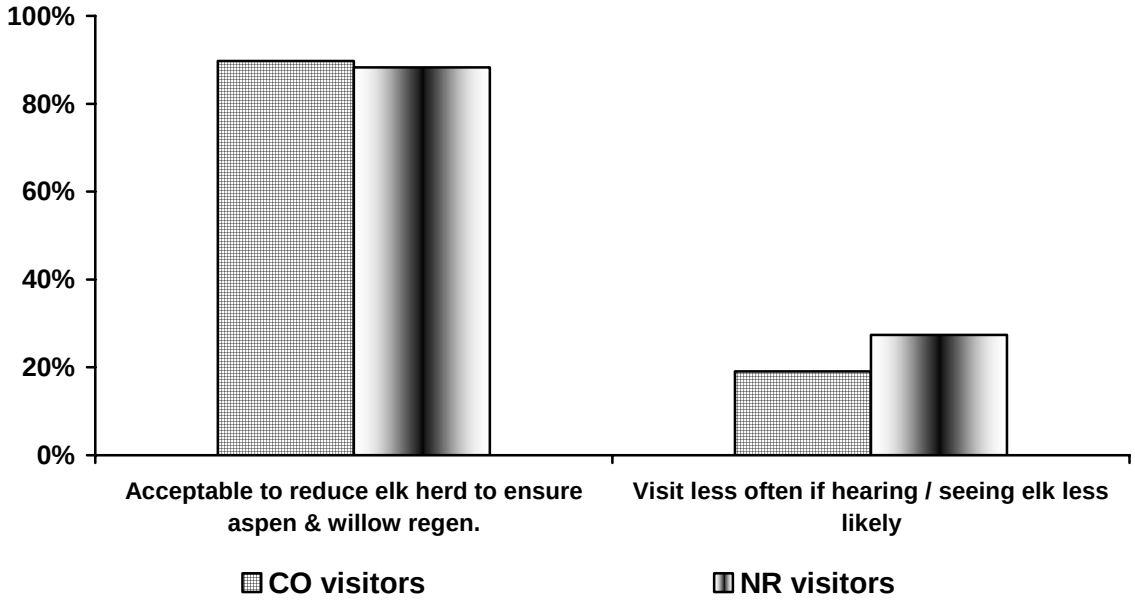
High percentages of respondents in both visitor strata agreed with the statements related to the reduction of elk numbers, while low percentages agreed with the statements related to elk viewing.

- Approximately 90% of Colorado and non-resident visitors agreed with the statement "If natural conditions dictate there should be fewer elk in the Park, the elk herd should be reduced," while only 2 out of 10 of these respondents agreed with the statement "It is important to maximize elk viewing, even if it results in a loss of vegetation on the elk winter concentration area" (Figure 23).
- As evidenced in Figure 24, roughly 9 out of 10 respondents in these strata agreed with the statement "It is acceptable to reduce the size of the elk herd to ensure that aspen and willow regenerate."
- About 20% of Colorado visitors and 30% of non-resident visitors agreed with the statement "I would visit RMNP less often if seeing / hearing elk was less likely" (Figure 24).



1. % of respondents who slightly, moderately, or highly agree with each belief statement.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's = 367 and 370, respectively, for Colorado visitors and 399 and 400, respectively, for non-resident visitors.
4. Chi values: Maximize elk viewing, $\chi^2 = 4.56$, sig. = .10; Reduce elk if natural conditions dictate, $\chi^2 = 1.45$, sig = .48.

Figure 23. General beliefs about Elk and Vegetation Management in RMNP



1. % of respondents who slightly, moderately, or highly agree with each belief statement.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".

c. n's = 370 and 371, respectively, for Colorado visitors and 401and 404, respectively for non-resident visitors.

d. Chi values: Reduce elk for vegetation regen., $\chi^2 = 4.45$, sig. = .11; Visit less, $\chi^2 = 7.94$, sig = .02.

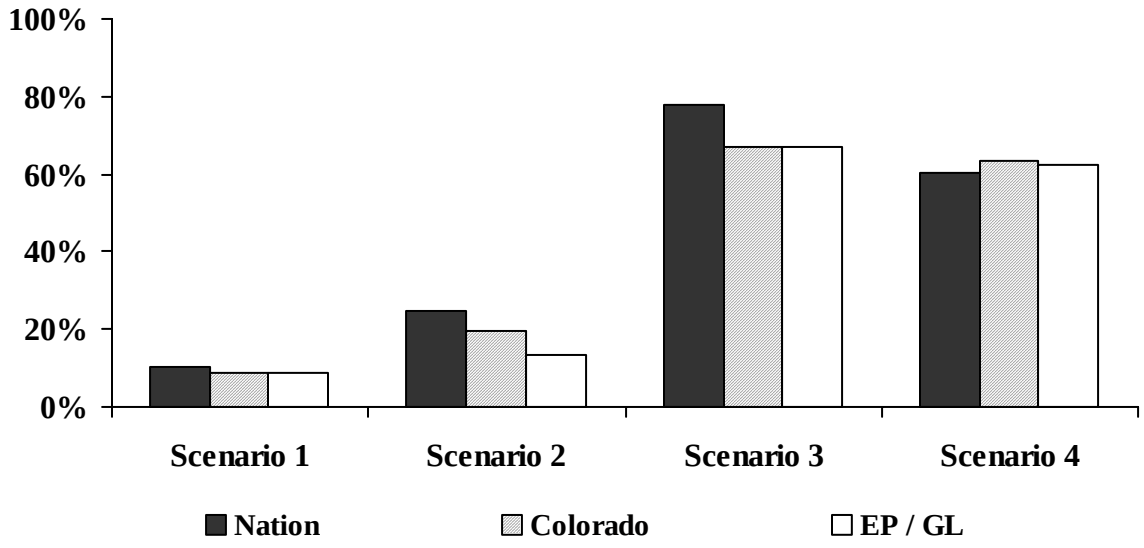
Figure 24. General beliefs about Elk and Vegetation Management in RMNP

Results of Residents of Estes Park / Grand Lake, Colorado, and the Nation

Acceptability of Hypothetical Future Scenarios

As in the visitor strata, Scenario 3, which maintained relatively large areas of aspen and willow with a corresponding moderate elk reduction, had a high level of acceptability (Figure 25).

- Scenario 4, which resulted in widespread regeneration of aspen and willow with a corresponding large reduction in elk, was also rated acceptable by approximately 6 out of 10 respondents.
- Only about 1 out of 10 respondents national, Colorado, and Estes Park / Grand Lake residents found Scenario 1, which left elk numbers at the current levels with no corresponding management actions, to be acceptable.
- Approximately 1 in 4 national respondents found Scenario 2, which calls for a small amount of vegetative protection with no reduction in elk numbers, acceptable, while about 2 out of 10 respondents in the Colorado stratum and 1 out of 10 respondents in the Estes Park / Grand Lake stratum found this scenario acceptable.



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 151 and 154 for national residents, between 217 and 220 for Colorado residents, and between 283 and 286 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 4 questions.
4. Chi values: Scenario 1 χ^2= 3.46, sig. = .49; Scenario 2, χ^2= 15.40, sig = .004; Scenario 3, χ^2= 16.63, sig. = .002; Scenario 4, χ^2= 5.98, sig = .20.

Figure 25. Acceptability of Hypothetical Future Scenarios in RMNP, Resident Strata

Most preferred and most opposed alternative

Scenario 3 was the most preferred scenario, being preferred by approximately half of respondents. Scenario 1 was evaluated as the most opposed by three-quarters of respondents and Scenario 4 by one-quarter.

Table 7. Most Preferred and most opposed Management Scenario

	Most preferred scenario [b]					Most opposed scenario [c]				
Strata [a]	n	1	2	3	4	n	1	2	3	4
National	152	2.3[2]	9.2	51.2	37.3	100	69.7	2.8	1.6	26.0
Colorado	218	3.2	5.8	47.8	42.9	156	74.4	1.4	.8	23.3
Estes Park / Grand Lake	282	1.4	7.7	50.1	40.8	218	74.1	1.6	.5	23.8

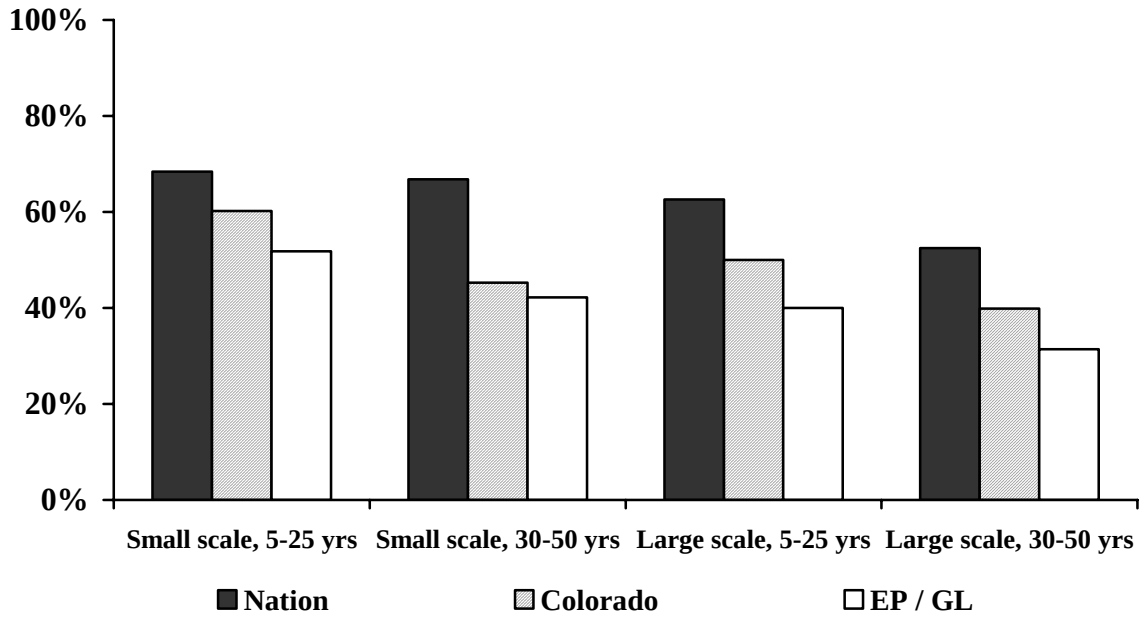
a. Data weighted by "Humans should manage wild animal populations so that humans benefit".
b. Cell entries are % selecting each scenario as the "most preferred".
c. Cell entries are % selecting each scenario as the "most opposed".

Acceptability of management actions *inside* Rocky Mountain National Park

Fencing in RMNP

Small-scale fencing, in place for 5-25 years, was acceptable to approximately 7 out of 10 national respondents, 6 out of 10 Colorado respondents, and 5 out of 10 Estes Park / Grand Lake respondents (Figure 26).

- Generally, at least half of all national respondents found all levels of fencing to be acceptable, with about 70% finding small-scale fencing to be generally acceptable, and 60% evaluated large-scale fencing, in place for 5-25 years as acceptable. Large-scale fencing, in place for 30-50 years was rated acceptable by about 50% of national respondents.
- Colorado residents' responses varied according to the length of application of the fencing, with half of respondents finding large-scale fencing, in place for 5-25 years acceptable, and 45% to 40%, respectively, rating small-scale and large-scale fencing, in place for 30-50 years acceptable.
- Small-scale fencing, in place for 30-50 years, and either derivation of large-scale fencing was found acceptable by less than half of Estes Park / Grand Lake residents.



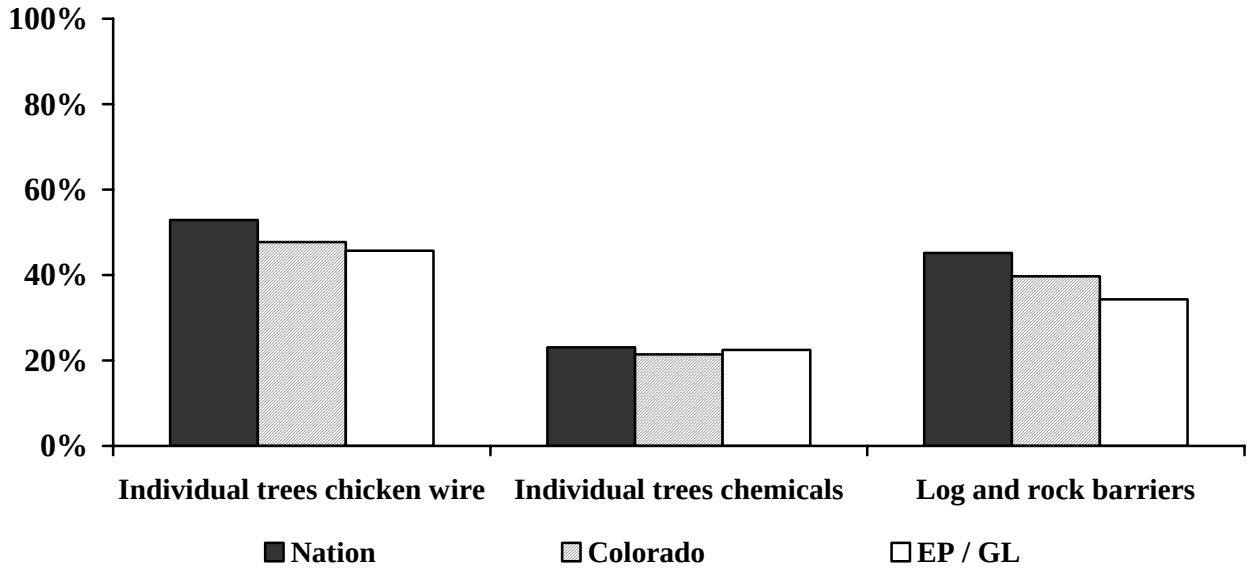
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 144 and 151 for national residents, between 211 and 217 for Colorado residents, and between 275 and 281 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 4 questions.
4. Chi values: Small scale, 5-25, χ^2= 18.55, sig. = .001; Small scale 30-50, χ^2= 31.37, sig < .001; Large scale, 5-25, χ^2= 29.36, sig. < .001; Large scale 30-50, χ^2= 27.46, sig < .001.

Figure 26. Acceptability of Fencing Management Actions in RMNP, Resident Strata

Resource protection

Both the protection of individual trees and shrubs from browsing by mechanical means (e.g. chicken wire) and protection with log and rock barriers were found to be acceptable by approximately half of the respondents in these strata (with the exception of Estes Park and Grand Lake residents, in which case about 40% found protection with log and rock barriers to be acceptable). (Figure 27).

- Treating individual trees and shrubs chemically to protect them from browsing was the least acceptable of the resource protection actions, as approximately 20% of respondents rated this technique as acceptable.



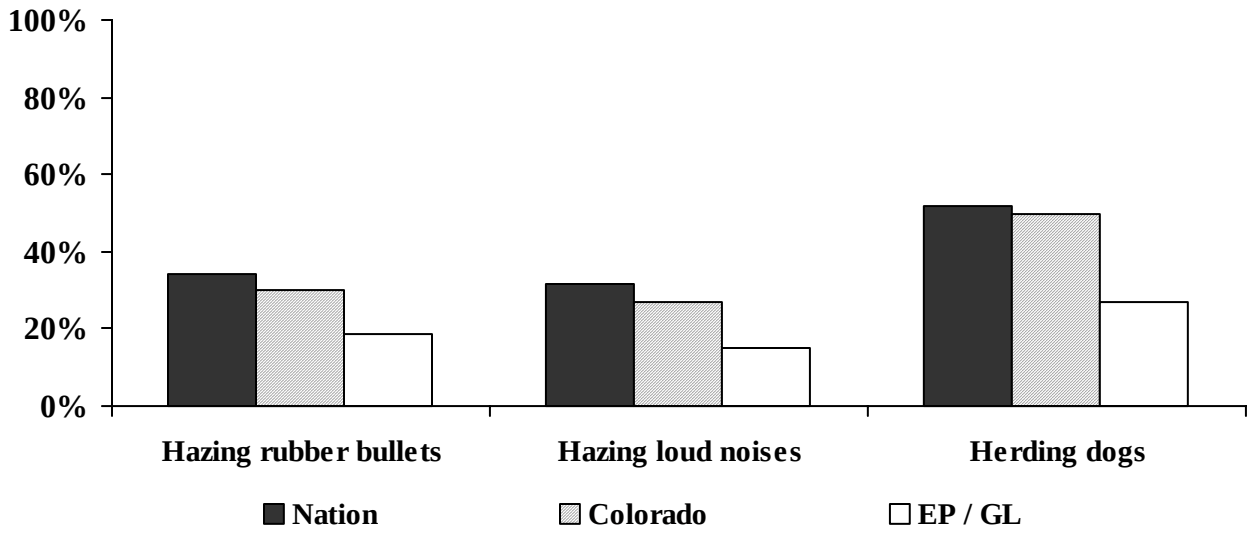
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 154 and 159 for national residents, between 226 and 228 for Colorado residents, and between 291 and 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Chicken wire, χ^2= 12.28, sig. = .02; Chemicals, χ^2= 2.15, sig = .71; Barriers, χ^2= 19.49, sig. = .001.

Figure 27. Acceptability of Resource Protection Management Activities in RMNP, Resident Strata

Hazing techniques

Of the hazing techniques suggested for moving elk away from sensitive vegetation areas, the use of herding dogs was generally the most acceptable (Figure 28), as half of respondents rated it as such (with the exception of the Estes Park / Grand Lake stratum, in which about 30% of respondents rated this action as acceptable).

- While there were significant differences between the strata in the number of respondents who evaluated either hazing elk with rubber bullets or buckshot, or hazing elk with loud noises as acceptable, there appears to be similarity within a stratum in the general acceptability of these two hazing alternatives. For example, 30% of national residents rated hazing elk with rubber bullets or buckshot as acceptable, and 31% of this stratum rated hazing elk with loud noises as acceptable.



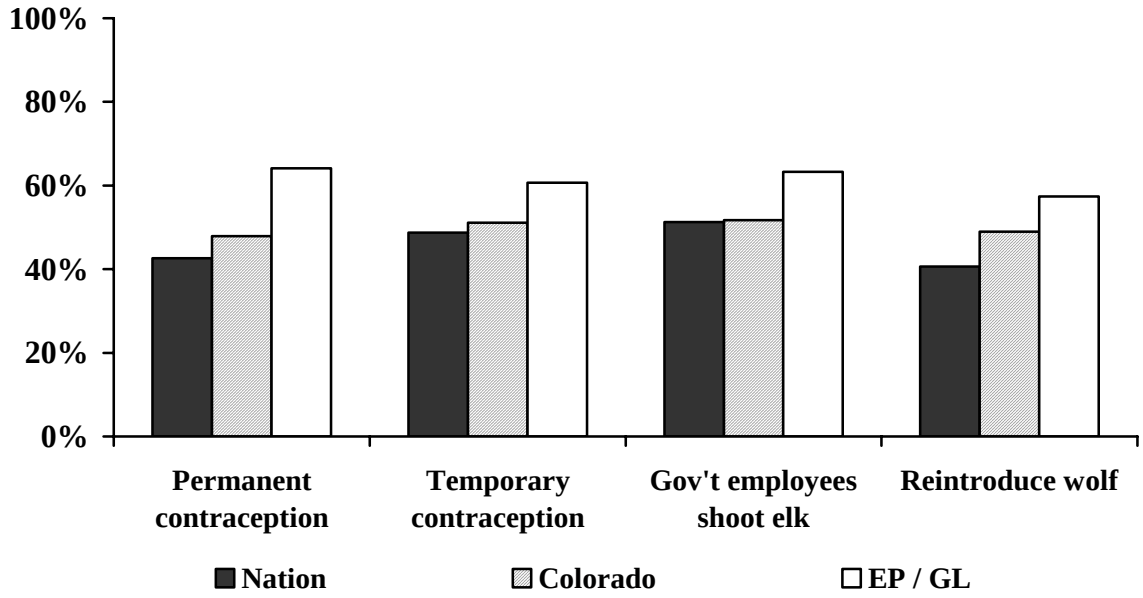
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 154 and 158 for national residents, between 227 and 228 for Colorado residents, and between 290 and 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Hazing with rubber bullets, χ^2= 12.48, sig. = .01; Hazing with noise, χ^2= 34.06, sig < .001; Herding dogs, χ^2= 51.63, sig. < .001.

Figure 28. Acceptability of Hazing Techniques in RMNP, Resident Strata

Methods to reduce elk numbers

The proposed management actions that focus on the reduction of elk numbers inside RMNP were all rated as acceptable by roughly half of the respondents in the national, Colorado, and Estes Park / Grand Lake strata, with the exception of the application of permanent contraception and the reintroduction of wolves, which were both rated as acceptable by about 40% of national residents (Figure 29).

- Approximately 50% of national and Colorado residents evaluated the use of government employees to shoot a targeted number of elk as acceptable, and about 60% of Estes Park / Grand Lake residents found it acceptable.
- The Estes Park / Grand Lake stratum had the highest percentages of respondents judging this group of management actions to be acceptable (about 6 out of 10 respondents evaluated each of the four actions as acceptable).



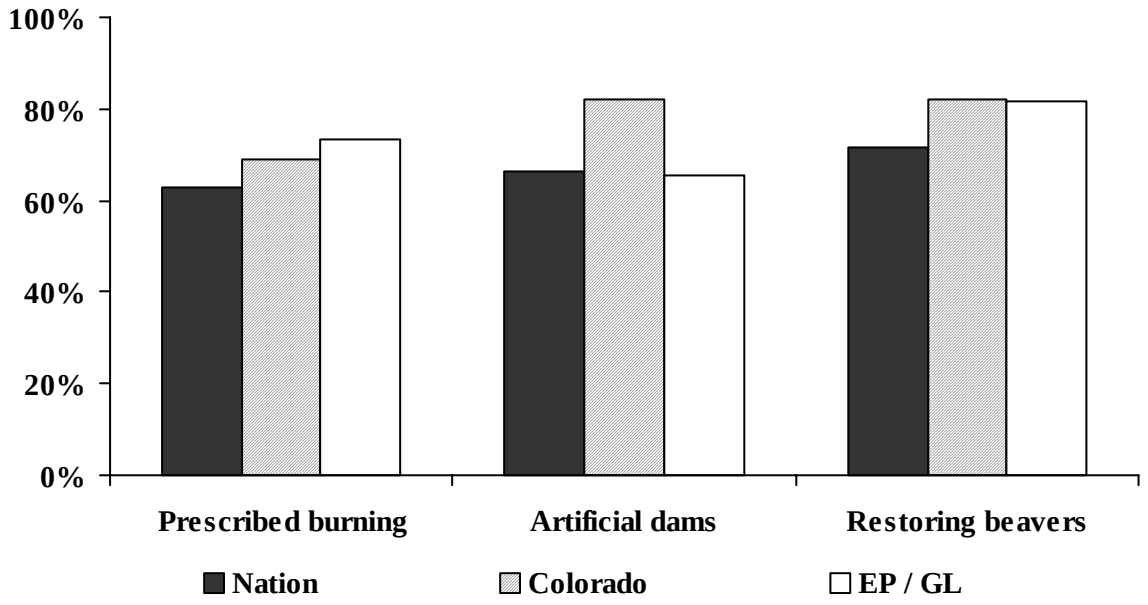
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 157 and 159 for national residents, n = 228 for Colorado residents, and range between 288 and 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 4 questions.
4. Chi values: Perm contraception, χ^2= 24.11, sig. < .001; Temp contraception, χ^2= 14.66, sig = .005; Shoot elk, χ^2= 10.27, sig. = .04; Reintroduce wolf, χ^2= 11.84, sig = .02.

Figure 29. Acceptability of Management Actions that Reduce Elk Numbers in RMNP, Resident Strata

Habitat improvements

All of the management actions centered around improvements to habitat inside RMNP in order to support or stimulate vegetative growth were evaluated as acceptable by at least 6 out of 10 respondents in the national, Colorado, and Estes Park / Grand Lake strata (Figure 30).

- The restoration of beavers to increase the amount of water available to support willow growth was found to be acceptable by about 80% of Colorado and Estes Park / Grand Lake residents and by roughly 70% of respondents in the national stratum.
- The use of prescribed burning in RMNP to stimulate vegetation growth was evaluated as acceptable by approximately 7 out of 10 Colorado and Estes Park / Grand Lake residents, and 6 out of 10 respondents in the national strata.
- Roughly 65% of respondents in the national and Estes Park / Grand Lake strata judged the construction of artificial dams in wetland areas in RMNP to be acceptable whereas 80% of Colorado residents evaluated it as acceptable.

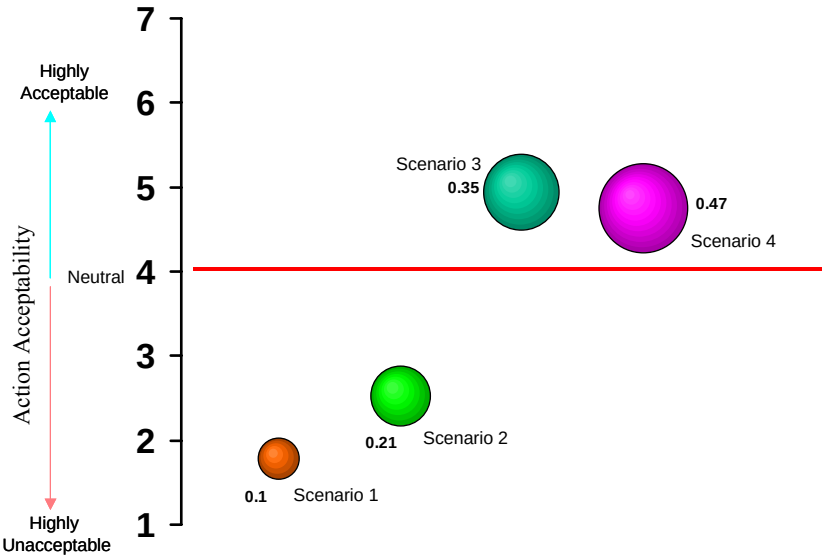


1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 155 and 159 for national residents, between 226 and 228 for Colorado residents, and between 290 and 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Prescribed burning, χ^2= 22.32, sig. < .001; Artificial dams, χ^2= 34.81, sig < .001; Beavers, χ^2= 17.22, sig. = .002.

Figure 30. Acceptability of Habitat Improvement Management Actions in RMNP, Resident Strata

Potential Conflict Index for Management Actions *inside* Rocky Mountain National Park

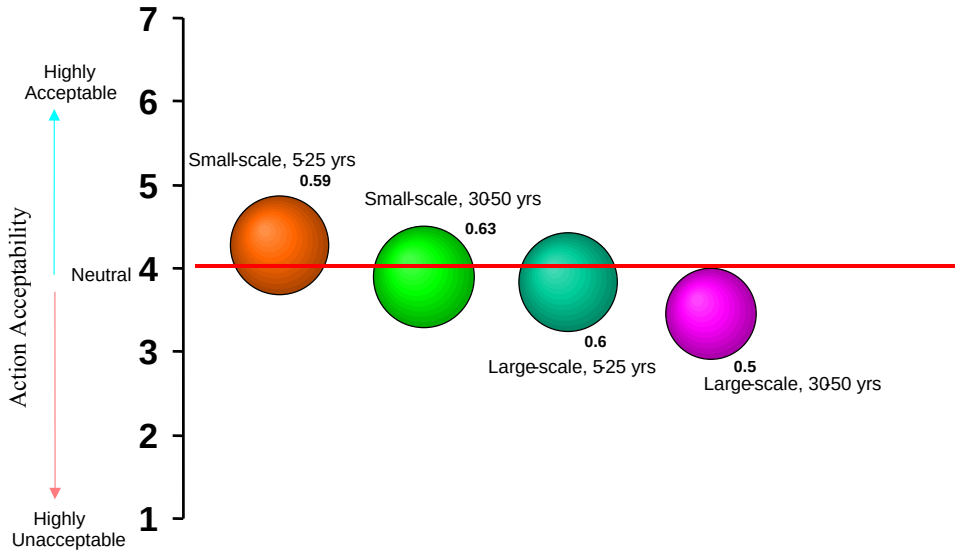
Resident strata



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 651 and 658. See Appendix D for individual n's for these 4 questions.

Figure 31. Potential Conflict Index for Future Hypothetical Scenarios in RMNP, Resident Strata

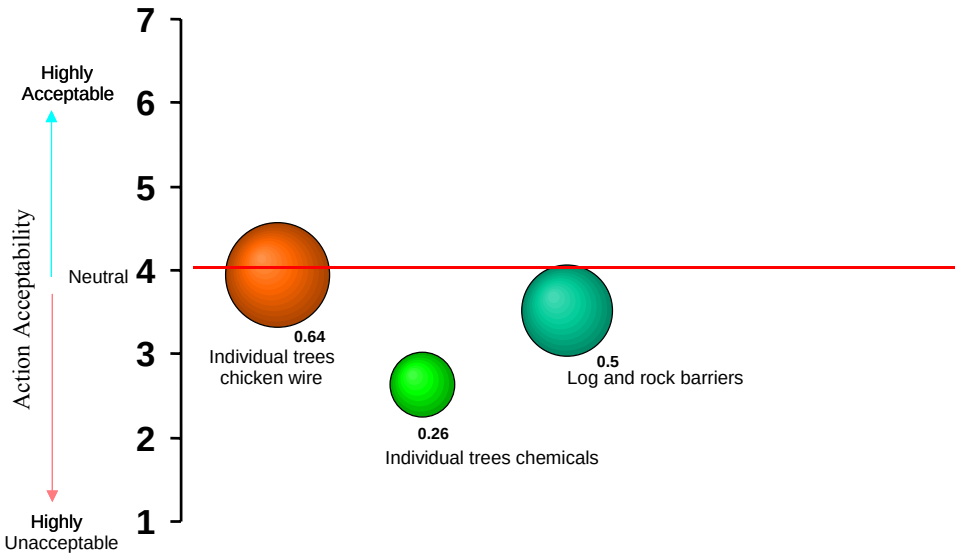
- The mean acceptability of Scenario 3 and Scenario 4 is on the acceptable side of the neutral line, although there is less agreement about the acceptability of Scenario 4.
- Scenario 1 and Scenario 2 were both found to be unacceptable, with high levels of agreement among respondents in the national, Colorado, and Estes Park / Grand Lake strata.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 633 and 649. See Appendix D for individual n's for these 4 questions.

Figure 32. Potential Conflict Index for Fencing Management Actions in RMNP, Resident Strata

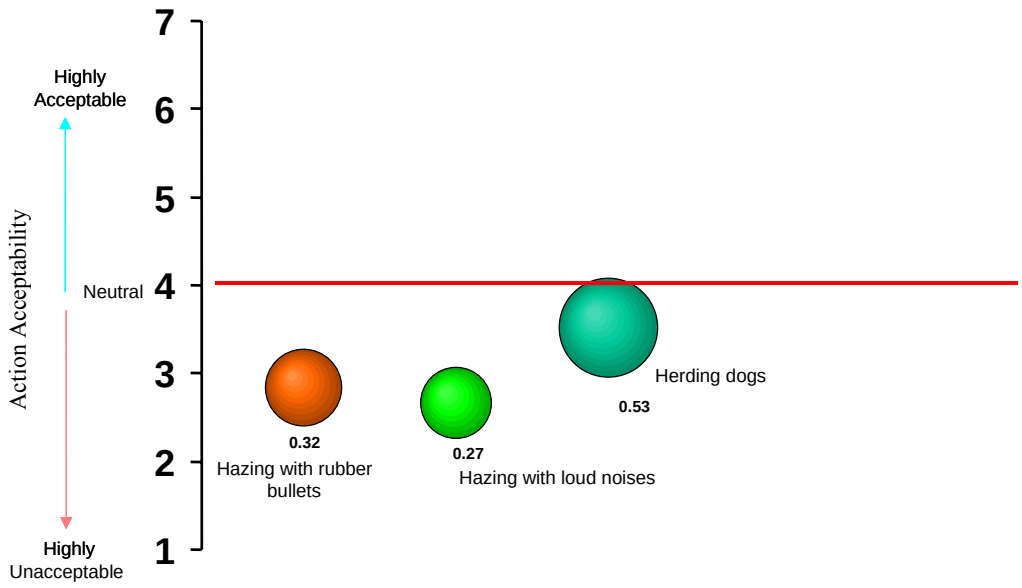
- The fencing actions in RMNP have means that cluster around the neutral line and relatively high PCI's.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 674 and 678. See Appendix D for individual n's for these 3 questions.

Figure 33. Potential Conflict Index for Resource Protection Management Actions in RMNP, Resident Strata

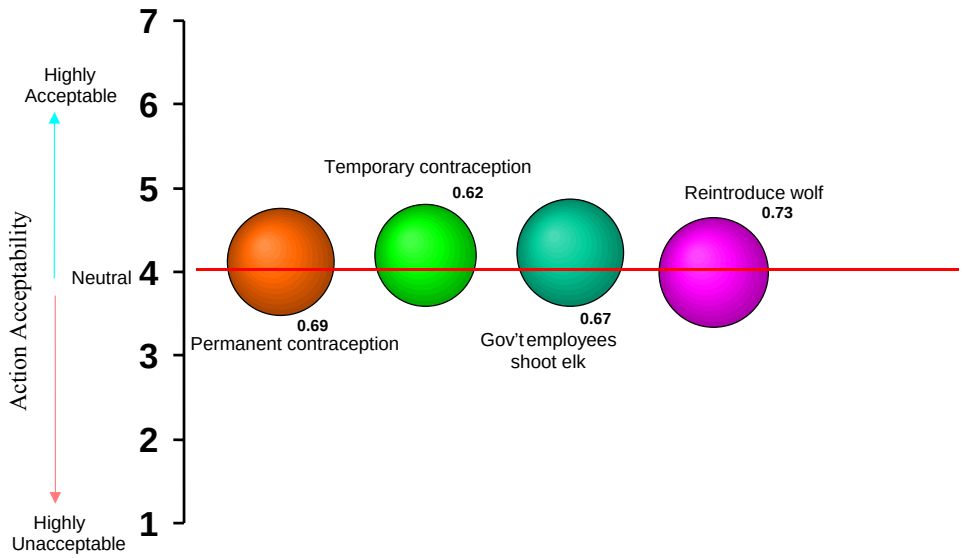
- For the national, Colorado, and Estes Park / Grand Lake resident strata, the protection of individual trees with chicken wire and protection by log and rock barriers had means close to the neutral line, but there appears to be more disagreement about mechanical protection such as chicken wire.
- The protection of individual trees with chemicals had high agreement about its unacceptability.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 671 and 679. See Appendix D for individual n's for these 3 questions.

Figure 34. Potential Conflict Index for Hazing Management Actions in RMNP, Resident Strata

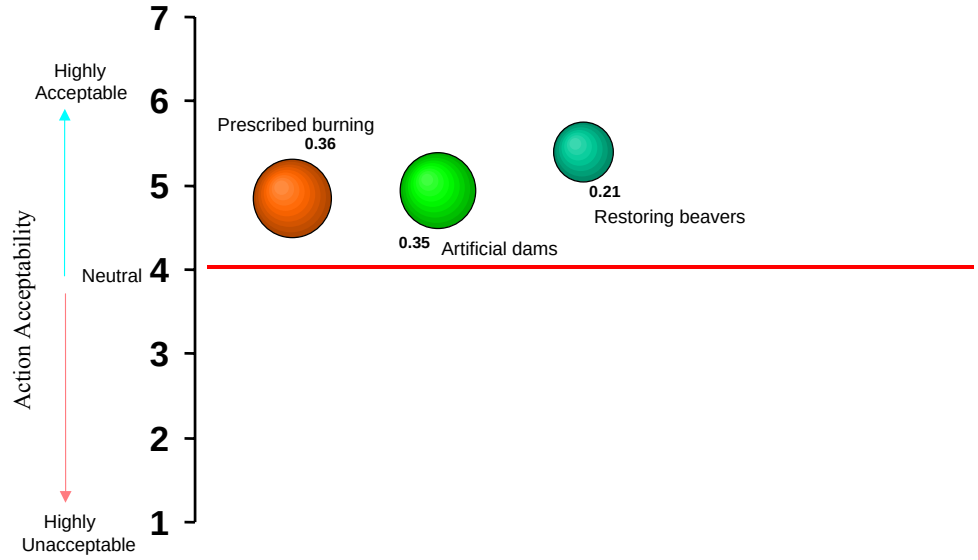
- Hazing techniques suggested for use inside RMNP were not found to be acceptable by the resident strata, although there is some disagreement about this regarding the use of herding dogs.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 673 and 681. See Appendix D for individual n's for these 4 questions.

Figure 35. Potential Conflict Index for Elk Reduction Management Actions in RMNP, Resident Strata

- All methods suggested to reduce elk numbers inside RMNP have high potentials for conflict among the resident strata.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 674 and 675. See Appendix D for individual n's for these 3 questions.

Figure 36. Potential Conflict Index for Habitat Improvement Management Actions in RMNP, Resident Strata

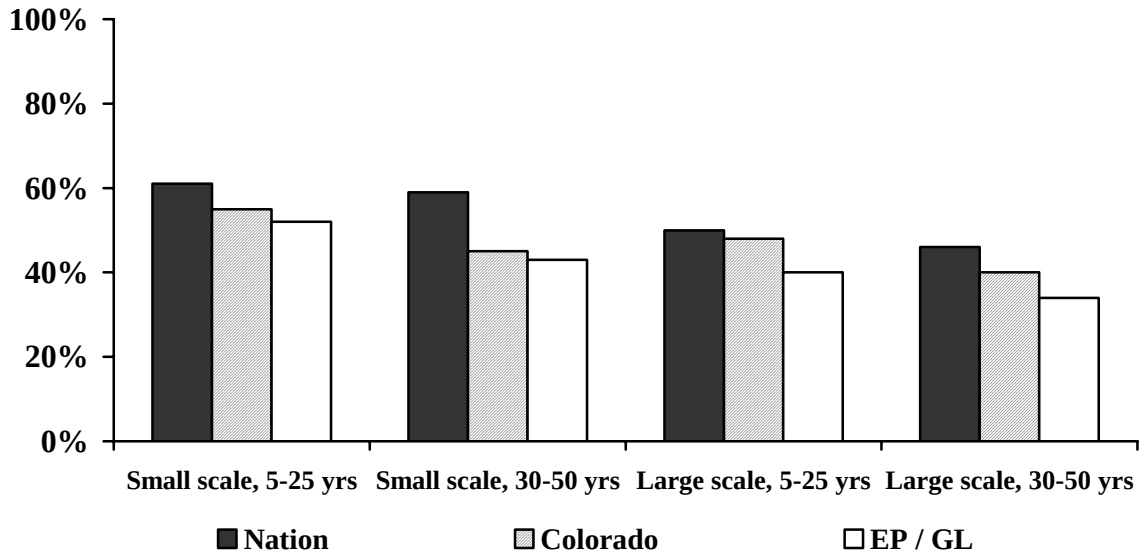
- All management actions suggested to stimulate or support vegetation growth were rated as acceptable by the national, Colorado, and Estes Park / Grand Lake strata, and there appeared to be relative agreement among respondents about the acceptability of these alternatives.

Acceptability of management actions *outside* Rocky Mountain National Park

Fencing outside RMNP

Small-scale fencing, applied for a period of 5-25 years, was rated as acceptable by over 50% of national, Colorado, and Estes Park / Grand Lake respondents (Figure 37).

- Large-scale fencing, in place for 30-50 years was rated as acceptable by less than half of respondents in any stratum.
- Small-scale and large-scale fencing applied for a period of 5-25 years was found acceptable by approximately 55% and 50% of Colorado residents, respectively. Fencing of either scale applied for a 30-50 year period was found acceptable by approximately 45% and 40% of Colorado residents, respectively.
- Less than half of Estes Park and Grand Lake respondents found small-scale fencing for 30-50 years and large-scale fencing of any length of time acceptable, with only about 3 out of 10 respondents rating long-term, large-scale fencing acceptable.



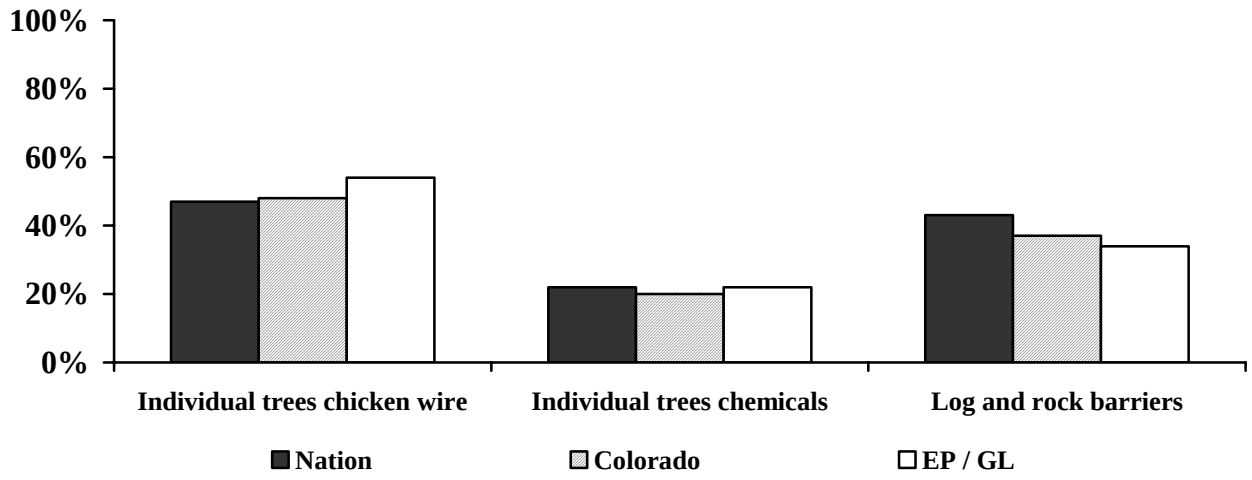
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 146 and 150 for national residents, between 209 and 211 for Colorado residents, and between 272 and 280 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 4 questions.
4. Chi values: Small scale, 5-25, χ^2= 16.24, sig. = .003; Small scale 30-50, χ^2= 22.97, sig < .001; Large scale, 5-25, χ^2= 26.99, sig. < .001; Large scale, 30-50, χ^2= 18.66, sig < .001.

Figure 37. Acceptability of Fencing Management Actions outside RMNP, Resident Strata

Resource protection

Generally, of the resource protection techniques for areas outside RMNP, protecting individual trees and shrubs with mechanical protection such as chicken wire was rated as acceptable of the resource protection techniques for areas outside RMNP by approximately 50% of all respondents in the national, Colorado, and Estes Park / Grand Lake strata (Figure 38).

- The protection of vegetation with log and rock barriers was rated as an acceptable resource protection method by about 4 out of 10 national and Colorado respondents, and 3 out of 10 Estes Park / Grand Lake respondents.
- Treating individual trees and shrubs with chemicals to prevent browsing from elk was the least acceptable of these three management alternatives as only 2 out of 10 respondents in any of the three strata evaluated it as being acceptable.



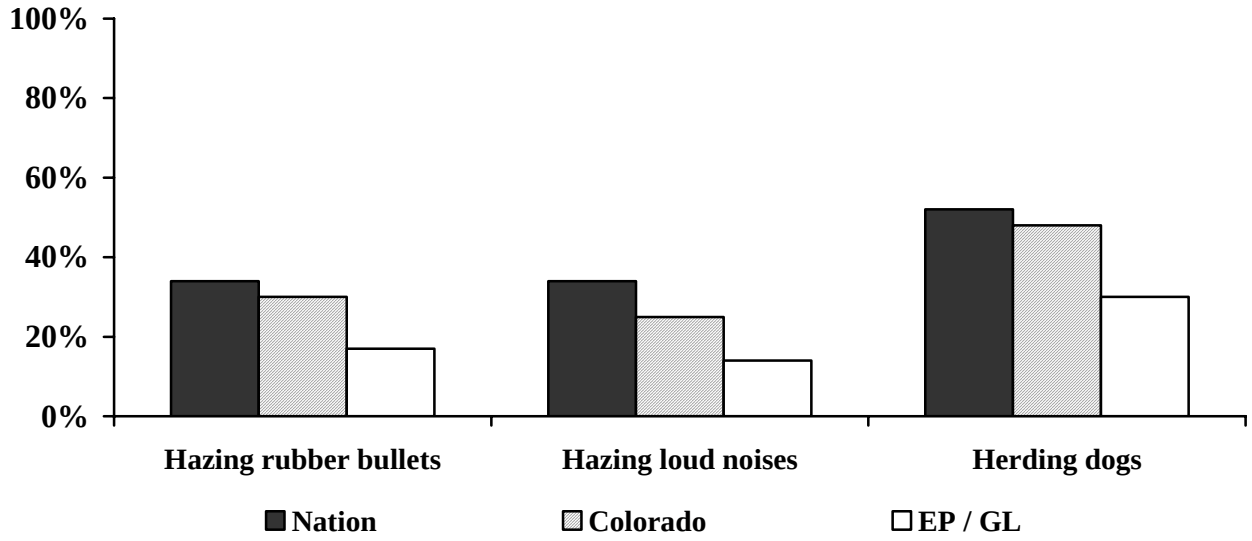
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 155 and 157 for national residents, between 219 and 223 for Colorado residents, and between 288 and 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Chicken wire, χ^2= 16.17, sig. = .003; Chemicals, χ^2= 2.05, sig = .73; Barriers, χ^2= 11.67, sig. = .02 .

Figure 38. Acceptability of Resource Protection Management Activities outside RMNP, Resident Strata

Hazing techniques

The use of herding dogs to move elk away from sensitive vegetation areas was the most acceptable of the hazing techniques possible for implementation outside RMNP (Figure 39). Roughly half of national and Colorado respondents rated it as acceptable, while only 30% of Estes Park / Grand Lake respondents found this to be an acceptable management action.

- Response to the other two hazing techniques (hazing elk with rubber bullets or buckshot and hazing elk with loud noises) used outside the park appear to be similarly evaluated within strata.
- Estes Park and Grand Lake residents had lower percentages of respondents ranking these techniques as acceptable than either of the other two strata. Only about 20% found hazing elk with rubber bullets or buckshot to be acceptable, and about 10% rated hazing elk with loud noises as an acceptable technique outside RMNP.



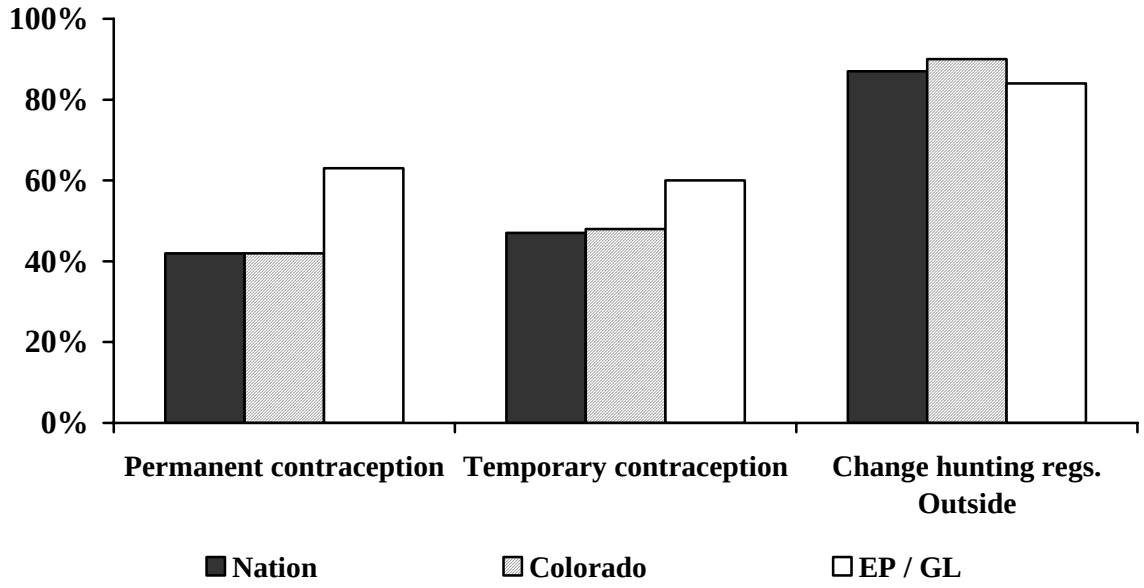
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 155 and 156 for national residents, between 220 and 222 for Colorado residents, and between 289 and 292 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Hazing with guns, χ^2= 19.87, sig. = .001; Hazing with noise, χ^2= 44.72, sig < .001; Herding dogs, χ^2= 43.87, sig. < .001.

Figure 39. Acceptability of Hazing Techniques outside RMNP, Resident Strata

Methods to reduce elk numbers

Of the possible management actions suggested that would reduce elk numbers, changing elk hunting regulations in areas outside RMNP where hunting is currently allowed was the most acceptable as rated by all three of these strata (Figure 40), with no significant differences among the three groups. Approximately 90% of national and Colorado resident respondents and about 85% of Estes Park / Grand Lake resident respondents evaluated this suggested action as acceptable.

- Application of a temporary contraceptive to elk was acceptable to approximately half of national and Colorado respondents.
- Reducing elk numbers by applying a permanent contraceptive to them outside RMNP was found to be acceptable by about 4 out of 10 national and Colorado respondents.
- Estes Park and Grand Lake residents had the highest percentages of respondents rating contraception as an acceptable elk reduction technique (roughly 60% for either permanent or temporary contraception).



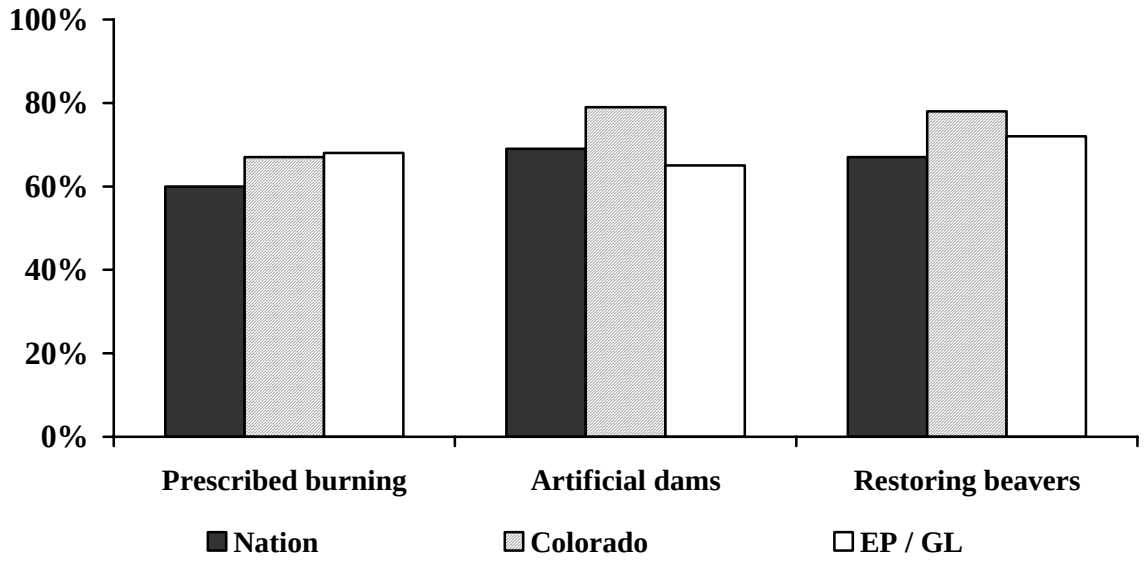
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's range between 156 and 159 for national residents, between 224 and 229 for Colorado residents, and n = 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Perm contraception, χ^2= 29.73, sig. < .001; Temp contraception, χ^2= 15.40, sig = .004; Change hunting regs, χ^2= 6.86, sig. = .14.

Figure 40. Acceptability of Management Actions that Reduce Elk Numbers outside RMNP, Resident Strata

Habitat improvements

Overall, habitat improvement techniques implemented outside RMNP were evaluated as acceptable by at least 60% of respondents in all strata.

- Colorado respondents were more accepting of both restoring beavers and the construction of artificial dams.

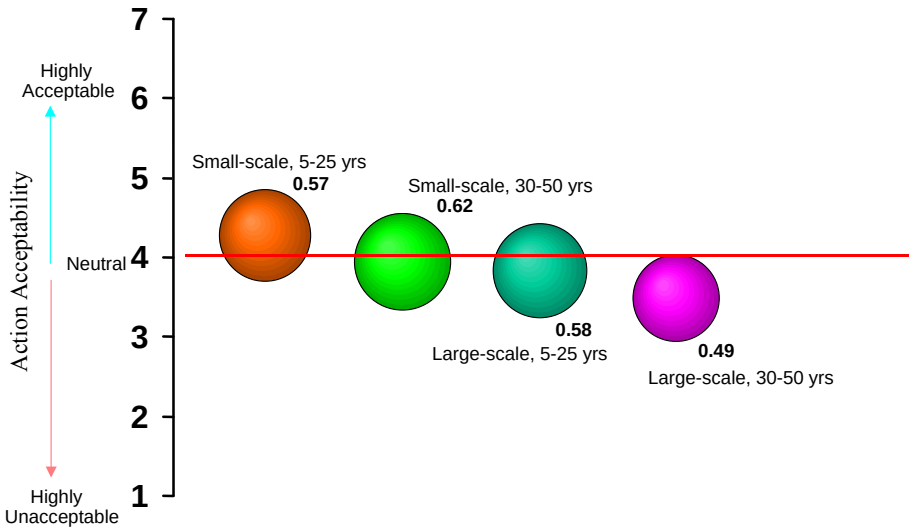


1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n = 157 for national residents, range between 219 and 223 for Colorado residents, and between 286 and 293 for Estes Park / Grand Lake residents. See Appendix D for individual n's for these 3 questions.
4. Chi values: Prescribed burning, χ^2= 22.16, sig. < .001; Artificial dams, χ^2= 17.22, sig = .002; Beavers, χ^2= 14.32, sig. =.006.

Figure 41. Acceptability of Habitat Improvement Management Actions outside RMNP, Resident Strata

Potential Conflict Index for management actions outside Rocky Mountain National Park

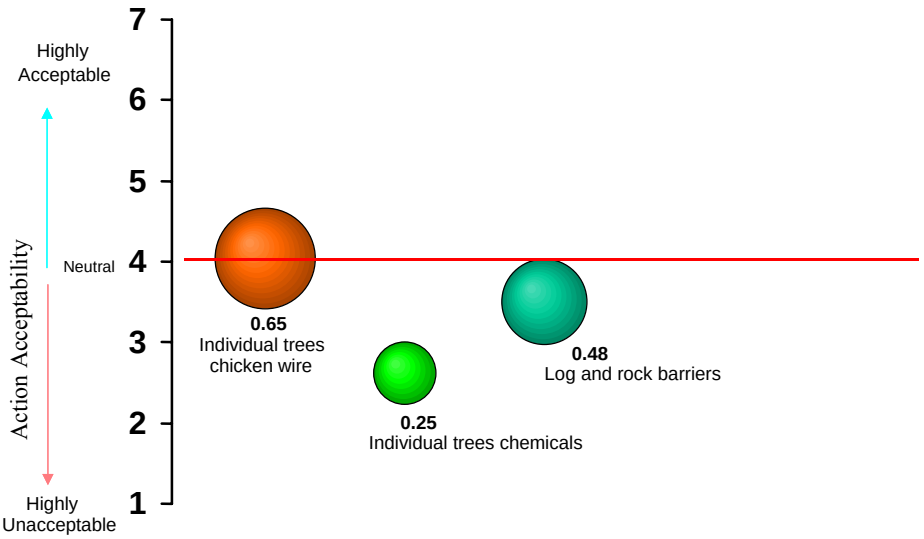
Resident Strata



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 628 and 642. See Appendix D for individual n's for these 4 questions.

Figure 42. Potential Conflict Index for Fencing Management Actions outside RMNP, Resident Strata

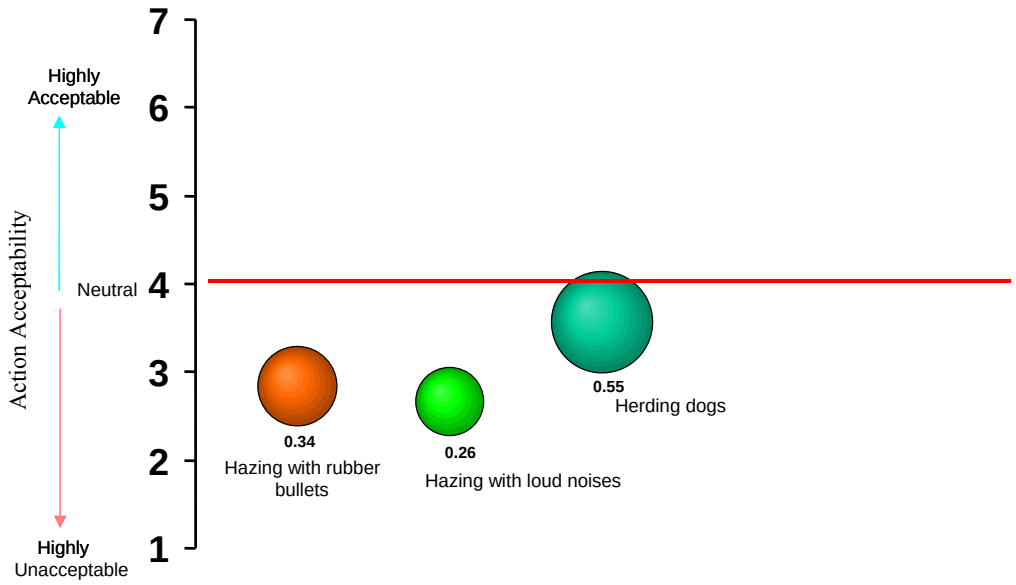
- Mean acceptability for the use of fencing to protect sensitive vegetation areas from browsing by elk, clustered around the neutral line, with perhaps more agreement over the unacceptability over the large-scale fencing, applied over a period of 30-50 years.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 664 and 673. See Appendix D for individual n's for these 3 questions.

Figure 43. Potential Conflict Index for Resource Protection Management Actions outside RMNP, Resident Strata

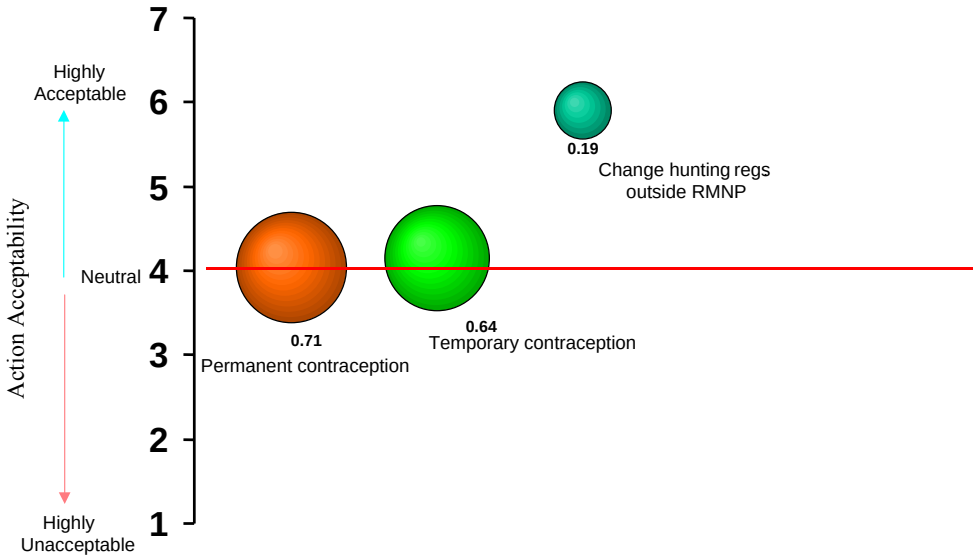
- The use of chicken wire outside RMNP to protect individual trees from elk browsing was evaluated on average as neutral by the resident strata, but it also has the highest potential for conflict.
- The use of log and rock barriers falls just over the unacceptable side of the neutral line, although there is some disagreement about the exact level of unacceptability.
- Protecting individual trees with chemicals was evaluated as unacceptable, with little disagreement among respondents.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 665 and 670. See Appendix D for individual n's for these 3 questions.

Figure 44. Potential Conflict Index for Hazing Management Actions outside RMNP, Resident Strata

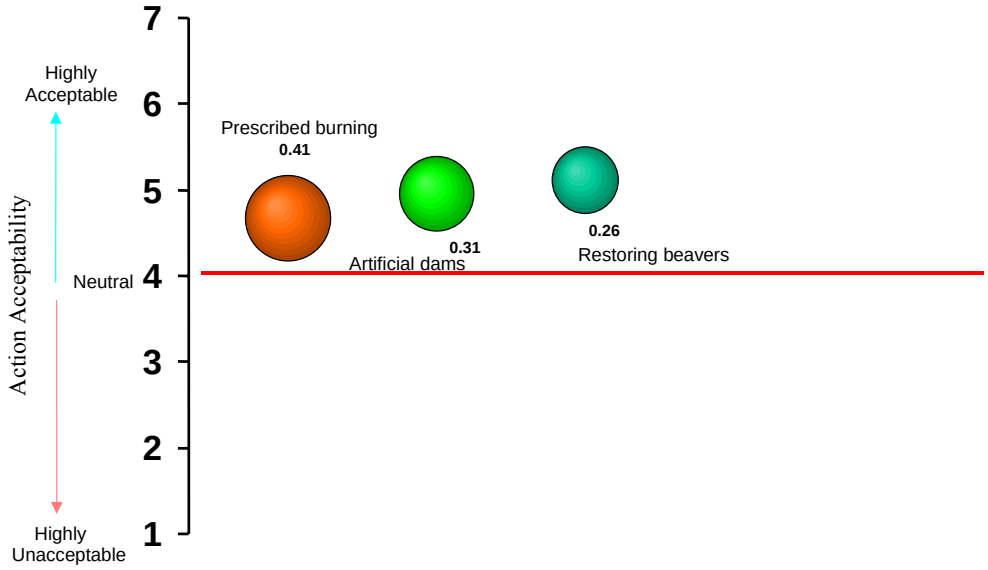
- Of the hazing techniques suggested outside RMNP, the use of herding dogs to move elk away from sensitive vegetation was the least unacceptable; it also has the highest potential for conflict.
- Hazing elk with rubber bullets or buckshot or with loud noises outside RMNP were both rated as unacceptable, with relative agreement on this point, by national, Colorado, and Estes Park / Grand Lake residents.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 673 and 681. See Appendix D for individual n's for these 3 questions.

Figure 45. Potential Conflict Index for Elk Reduction Management Actions outside RMNP, Resident Strata

- Changing hunting regulations outside RMNP to reduce elk numbers met with the highest level of acceptability, with a high level of agreement, by the resident strata, suggesting that there is not a great potential for conflict about this management alternative.
- Both permanent and temporary contraception used outside RMNP to reduce elk numbers had high PCI's, indicating a great deal of disagreement among resident strata about the acceptability of these actions, pointing to a high potential for conflict.



1. Includes the national, Colorado, and Estes Park / Grand Lake strata.
2. Response scale was highly acceptable to highly unacceptable.
3. Data weighted by "Humans should manage wild animal populations so that humans benefit".
4. n's range between 664 and 672. See Appendix D for individual n's for these 3 questions.

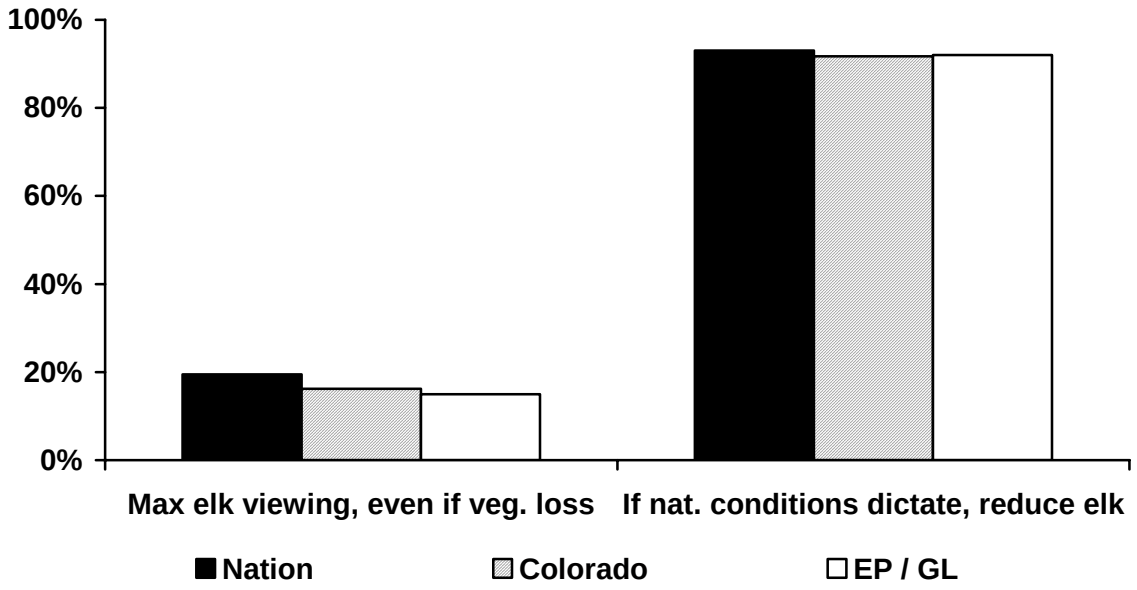
Figure 46. Potential Conflict Index for Habitat Improvement Management Actions outside RMNP, Resident Strata

- All management actions centered on stimulating or supporting vegetative growth outside RMNP were found to be acceptable by the resident strata.
- The use of prescribed burning to stimulate vegetation growth had the highest PCI, indicating there is some disagreement among these respondents about its level of acceptability.

General Questions about Elk and Vegetation Management in Rocky Mountain National Park

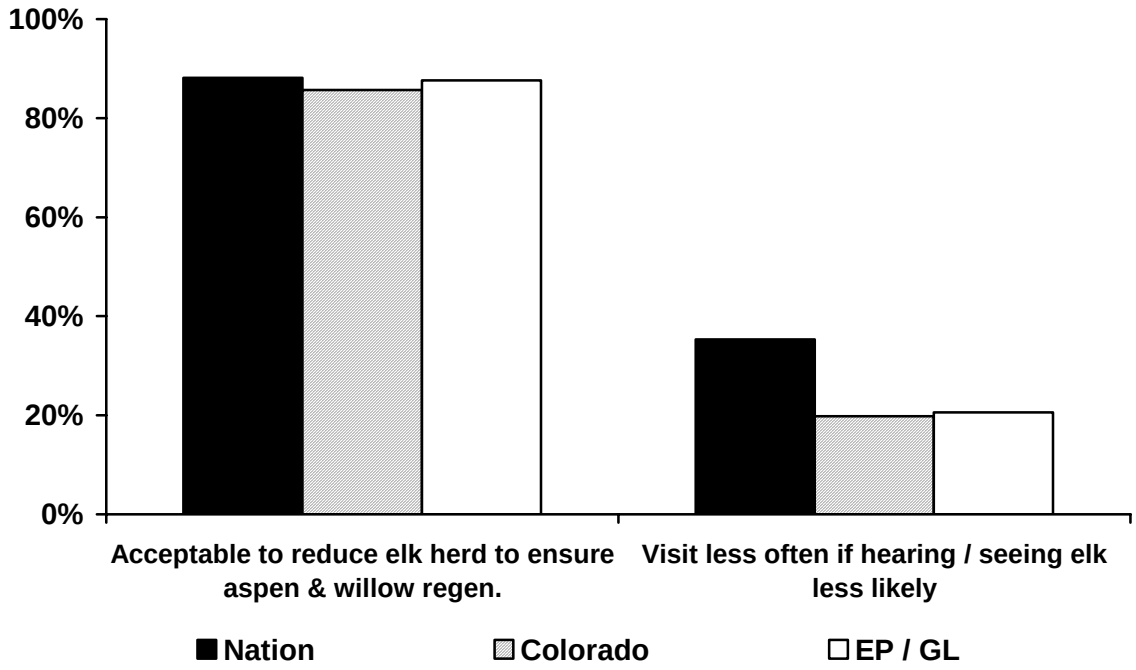
As was the case with the visitor strata, a high percentage of respondents in the national, Colorado, and Estes Park/Grand Lake groups agreed with statements regarding reducing the size of the elk herd, and in general, a relatively low percentage of respondents agreed with statements regarding elk viewing.

- About 90% of respondents in all three of these strata agreed with the statement "If natural conditions dictate there should be fewer elk in the Park, the elk herd should be reduced," whereas 20% of national respondents and about 15% of Colorado and Estes Park / Grand Lake respondents agreed with the statement "It is important to maximize elk viewing, even if it results in a loss of vegetation on the elk winter concentration area" (Figure 47).
- Approximately 9 out of 10 respondents in these strata agreed with the statement "It is acceptable to reduce the size of the elk herd to ensure that aspen and willow regenerate" (Figure 48).
- About 20% of Colorado and Estes Park and Grand Lake residents, and 35% of national residents agreed with the statement "I would visit RMNP less often if seeing / hearing elk was less likely" (Figure 48).



1. % of respondents who slightly, moderately, or highly agree with each belief statement.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's = 154 and 157, respectively, for national residents, 229 and 228, respectively, for Colorado residents, and 287 and 288, respectively, for Estes Park / Grand Lake residents.
4. Chi values: Maximize elk viewing, $\chi^2 = 22.63$, sig. < .001; Reduce elk if natural conditions dictate, $\chi^2 = 3.87$, sig = .42.

Figure 47. General Beliefs about Elk and Vegetation Management in RMNP



1. % of respondents who slightly, moderately, or highly agree with each belief statement.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n's = 159 and 156, respectively, for national residents, 231 and 227, respectively, for Colorado residents, and 291 for Estes Park / Grand Lake residents.
4. Chi values: Reduce elk for vegetation regen., $\chi^2 = 8.18$, sig. = .09; Visit less, $\chi^2 = 77.52$, sig < .001.

Figure 48. General Beliefs about Elk and Vegetation Management in RMNP

CORRELATIONS OF MANAGEMENT ACTIONS WITH WILDLIFE VALUE ORIENTATIONS

The term "values" has been used in the natural resource literature extensively. One perspective views values at the base of a hierarchy that drives our psychological thought processes and consequently direct our attitudes and thus, behaviors. They have been defined one way as "an enduring belief that a specific mode of conduct is personally or socially preferable to an opposite or converse mode of conduct or end state of existence" (Rokeach, 1973, 5). Various other definitions have arisen, but they have been said to have certain things in common such as the fact that they are concepts about desirable end states or behaviors, that transcend situations, guide behaviors, and are ordered by importance (Schwartz & Bilsky, 1987). Fulton, et al (1996) used these ideas specifically for wildlife management when they expanded on previous ideas and described them as underlying conceptions that drive attitudes and behaviors. While, as might have been noted, values themselves can be difficult to unequivocally assess, there are measures of components or conceptualizations of values that have proven useful in predicting attitudes, and consequently, behaviors.

One such measure is the concept of value orientations. Value orientations work in conjunction with basic beliefs as 2nd and 3rd order cognitions in the hierarchy of psychological patterns. They are groupings and individualized directions of fundamental values and are indicative of patterns of basic beliefs that people hold about different objects and/or situations. Their place in the cognitive hierarchy was secured when causal modeling was used to test the relationships between the various aspects of the hierarchy (Homer & Kahle, 1988). The notion of wildlife value orientations was introduced by Fulton, et al (1996), as patterns of beliefs about wildlife. Wildlife value orientations can give indications of the direction and pattern of an individual's values toward wildlife, and can be used as measures by which a person's attitudes and behaviors toward wildlife can be predicted with a fair degree of accuracy. For the purposes of this study, a subset of items intended to measure wildlife value orientations was adapted from the Fulton, et al study. The means of these items are identified in Table 8.

Table 8. Mean Scores of Wildlife Value Orientation Items.

Wildlife value orientation item[1]	Mean	Standard deviation
Humans should manage wild animal populations so that humans benefit	3.64	2.06
Animals should have rights similar to the rights of humans	3.27	2.05
It is important for humans to manage the populations of wild animals	5.40	1.66
I enjoy watching wildlife when I take a trip outdoors	6.68	.76
It is important to maintain wildlife so that future generations can enjoy them	6.69	.80
Hunting is cruel and inhumane to the animals	2.60	1.94

1. Items coded on a Likert-type scale from 1 (strongly disagree) to 7 (strongly agree).

In order to create a scale by which to measure wildlife value orientations, these items were entered into a reliability analysis and the internal consistency of the six items was measured. The items "I enjoy watching wildlife when I take a trip outdoors" and "It is important to maintain wildlife so that future generations can enjoy them" were part of a different orientation (Bequest / Existence) in the original groupings of wildlife value orientations, and so were removed from the scale being defined by the reliability analysis. The analysis indicated that the four remaining items had strong internal consistency (Cronbach's alpha = .68) and the items were combined into a scale. Results of the reliability analysis are shown in Table 9. The final wildlife value orientation scale followed the Protection-Use value orientation scale proposed by Fulton, et al, on which those individual's with high agreement about the protection of wildlife are found on one end of the scale, and those individuals with high agreement about the use of wildlife are found on the other.

Table 9. Reliability of Items in Wildlife Value Orientation Scale.

	Item total correlation	Alpha if item deleted	Cronbach's alpha
			.68
Humans should manage wild animal populations so that humans benefit [1]	.43	.59	
Animals should have rights similar to the rights of humans	.47	.57	
It is important for humans to manage the populations of wild animals [1]	.43	.60	
Hunting is cruel and inhumane to the animals	.43	.59	

1. Coding for these variables was reversed.

Significant relationships were found to exist between wildlife value orientations and almost all of the management actions for elk and vegetation presented for possible implementation inside RMNP (Table 10). The only exceptions to this were the treatment of individual trees with chemicals to protect them from browsing by elk, the use of a permanent contraception on elk, and the construction of artificial dams to create wetlands in order to stimulate vegetation growth.

Table 10. Correlations between Wildlife Value Orientations and Acceptability of Management Actions Inside RMNP.[1]

Management alternatives[2]	Rights-Use Value Orientation[3]
Fencing Management Actions	
Small-scale, 5-25 yrs	-.10**
Small-scale, 30-50 yrs	-.16**
Large-scale, 5-25 yrs	-.12**
Large-scale, 30-50 yrs	-.12**
Resource Protection Management Actions	
Individual trees chicken wire	-.14**
Individual trees chemicals	.02
Log and rock barriers	-.21**
Hazing Techniques	
Hazing with rubber bullets	.06*
Hazing with loud noises	-.08**
Hazing using herding dogs	-.11**

Table 10. Continued

Elk Reduction Management Actions	
Permanent contraception	.001
Temporary contraception	-.13**
Culling with government employees	.40**
Reintroducing wolves	-.16**
Habitat Improvement Management Actions	
Prescribed burning	.05*
Artificial dams	-.004
Restoring beavers	-.13**

1. Scenarios were coded on a Likert-type scale from 1 (highly unacceptable) to 7 (highly acceptable).
2. High scores on the rights-use value orientation indicate agreement with the use of wildlife.

* Correlations significant at $p < .05$.

** Correlations significant at $p < .01$.

Correlations between wildlife value orientations and the acceptability of management actions outside the park (Table 11) follow similar patterns as those shown in Table 10. In addition to the aforementioned actions between which there was not a significant relationship, none was found between wildlife value orientations and the use of prescribed burning to stimulate vegetation growth outside RMNP.

Table 11. Correlations between Wildlife Value Orientations and Acceptability of Management Actions Outside RMNP.[1]

Management alternatives[2]	Rights-Use Value Orientation[3]
Fencing Management Actions	
Small-scale, 5-25 yrs	-.18**
Small-scale, 30-50 yrs	-.18**
Large-scale, 5-25 yrs	-.15**
Large-scale, 30-50 yrs	-.15**
Resource Protection Management Actions	
Individual trees chicken wire	-.16**
Individual trees chemicals	.02
Log and rock barriers	-.21**

Table 11. Continued

Hazing Techniques	
Hazing with rubber bullets	.07*
Hazing with loud noises	-.09**
Hazing using herding dogs	-.12**
Elk Reduction Management Actions	
Permanent contraception	-.01
Temporary contraception	-.14**
Changing hunting regulations outside RMNP	.49**
Habitat Improvement Management Actions	
Prescribed burning	.04
Artificial dams	-.03
Restoring beavers	-.15**

1. Scenarios were coded on a Likert-type scale from 1 (highly unacceptable) to 7 (highly acceptable).
2. High scores on the rights-use value orientation indicate agreement with the use of wildlife.

* Correlations significant at $p < .05$.

** Correlations significant at $p < .01$.

The general pattern of relationships between wildlife value orientations and acceptability of management actions indicates that those respondents who were more oriented toward the protection of wildlife were more accepting of management actions that would not directly harm elk or reduce their herd size. These actions focused on vegetative management such protection by barriers like fencing or chicken wire or the reintroduction of beavers to create wetlands to stimulate willow growth; they also included actions such as the use of temporary contraception and the reintroduction of wolves. People who related with the use of wildlife, however, were more accepting of actions that would directly impact elk and elk populations. Some examples of these were the use of government employees to cull a targeted number of elk, or changing hunting regulations outside the Park in order to reduce elk numbers.

COMPARISONS BETWEEN MANAGEMENT ACTIONS AND DEMOGRAPHIC VARIABLES

Correlations with age

In addition to correlating potential elk and vegetation management actions with wildlife value orientations, we tested the relationships between the acceptability of these actions and various demographic variables. These variables included age, sex, and whether the respondent was a permanent or seasonal resident of Estes Park or Grand Lake.

The first variable tested was age. In our sample, the average age of the respondent was 54. The highest percentage of respondents were between the ages of 45 and 54 (Table 12).

Table 12. Percentage of Respondents in each Age Group.

Age groups [1]	
18-24	2%
25-34	10%
35-44	15%
45-54	23%
55-59	14%
60-64	12%
65-74	17%
75-84	7%
85-94	1%
Average age of respondent	54

[1] Age groups based on categories defined by the U.S. Census Bureau.

Regarding management actions suggested for implementation inside RMNP (Table 13), people in younger age categories were inclined toward acceptance of small-scale fencing regardless of the length of time of application and large-scale fencing, applied for 5-25 years. They were also more accepting of the protection of individual trees with chicken wire or log and rock barriers, the use of loud noises or herding dogs to move elk away from sensitive vegetation, the reintroduction of wolves to reduce elk numbers, and the use of prescribed burning to stimulate vegetative growth. Acceptability rises with age categories in regards to treating individual trees with chemicals to protect them from browsing by elk, the use of either permanent or temporary contraception to reduce elk numbers, and the construction of artificial dams to create wetlands to stimulate vegetative growth. Results between age and the acceptability of management actions suggested for use outside RMNP were similar to those of actions suggested for use inside RMNP (Table 14). Respondents in younger age categories were more likely to be accepting of fencing regardless of the scale or length of application, and the protection of individual trees through the use of chicken wire or log and rock barriers. In addition, those in younger age categories were more likely to be accepting of moving elk away from sensitive vegetation with loud noises or herding dogs. Respondents in older age categories were more likely to be accepting of permanent contraception to reduce elk numbers.

Table 13. Correlations[1] between Age and Acceptability of Management Actions Inside RMNP.

Management alternatives[2]	Age[3]
Fencing Management Actions	
Small-scale, 5-25 yrs	-.13**
Small-scale, 30-50 yrs	-.10**
Large-scale, 5-25 yrs	-.06*
Large-scale, 30-50 yrs	-.03
Resource Protection Management Actions	
Individual trees chicken wire	-.08**
Individual trees chemicals	.10**
Log and rock barriers	-.22**
Hazing Techniques	
Hazing with rubber bullets	-.02
Hazing with loud noises	-.08**
Hazing using herding dogs	-.13**
Elk Reduction Management Actions	
Permanent contraception	.17**
Temporary contraception	.06*
Culling with government employees	.05
Reintroducing wolves	-.20**
Habitat Improvement Management Actions	
Prescribed burning	-.07**
Artificial dams	.11**
Restoring beavers	.04

1. Correlations are Spearman rank order correlations.
2. Scenarios were coded on a Likert-type scale from 1 (highly unacceptable) to 7 (highly acceptable).
3. Lower scores indicate a younger age category.

* Correlations significant at $p < .05$.

** Correlations significant at $p < .01$.

Table 14. Correlations[1] between Age and Acceptability of Management Actions Outside RMNP.

Management alternatives[2]	Age[3]
Fencing Management Actions	
Small-scale, 5-25 yrs	-.18**
Small-scale, 30-50 yrs	-.15**
Large-scale, 5-25 yrs	-.10**
Large-scale, 30-50 yrs	-.08**
Resource Protection Management Actions	
Individual trees chicken wire	-.08**
Individual trees chemicals	.10**
Log and rock barriers	-.24**
Hazing Techniques	
Hazing with rubber bullets	-.01
Hazing with loud noises	-.10**
Hazing using herding dogs	-.16**
Elk Reduction Management Actions	
Permanent contraception	.16**
Temporary contraception	.05
Changing hunting regulations outside RMNP	.02
Habitat Improvement Management Actions	
Prescribed burning	-.09**
Artificial dams	.04
Restoring beavers	-.008

1. Correlations are Spearman rank order correlations.
2. Scenarios were coded on a Likert-type scale from 1 (highly unacceptable) to 7 (highly acceptable).
3. Lower scores indicate a younger age category.

** Correlations significant at $p < .01$.

Comparison by sex

We also tested the relationships between acceptability of management actions both inside and outside the park and the sex of the respondents. As indicated in Table 15, there was approximately a 2 to 1 ration of men to women among respondents.

Table 15. Sex of Respondents.

Male	63%
Female	37%

n = 1471

Altogether there were significant relationships between sex and half of the management actions. Both inside RMNP (Table 16) and in areas outside the park (Table 17), women were more likely to find the protection of trees through the use of fencing acceptable, regardless of size or length of application. Females were also more accepting of the protection of individual trees with chicken wire or through the use of log or rock barriers, as well as the use of herding dogs to move elk away from sensitive vegetation. They were more likely to rate the use of permanent or temporary contraceptives as acceptable as they were the construction of artificial dams to create wetlands to promote vegetative growth. Men were more likely to be accepting of the protection of individual trees with chemicals both inside and outside the park. They were likely to be more accepting of culling a targeted number of elk inside RMNP and changing hunting regulations in areas outside the park in order to reduce elk numbers.

Table 16. Mean Acceptability of Management Actions Inside RMNP by Sex.[1]

Management alternatives[2]	Sex			
	Males		Females	
	M	SD	M	SD
Fencing Management Actions				
Small-scale, 5-25 yrs**	4.33	3.7	4.97	2.1
Small-scale, 30-50 yrs**	3.84	2.1	4.51	2.1
Large-scale, 5-25 yrs**	3.72	2.2	4.34	2.1
Large-scale, 30-50 yrs**	3.35	2.2	3.94	2.2
Resource Protection Management Actions				
Individual trees chicken wire**	3.89	2.1	4.58	2.2
Individual trees chemicals*	2.80	1.9	2.55	1.8
Log and rock barriers**	3.45	2.1	4.41	2.1

Table 16. Continued

Hazing Techniques				
Hazing with rubber bullets	2.94	2.1	3.07	2.4
Hazing with loud noises	2.69	1.9	2.81	1.9
Hazing using herding dogs**	3.50	2.2	4.40	2.2
Elk Reduction Management Actions				
Permanent contraception**	4.12	2.3	4.53	2.3
Temporary contraception**	4.23	2.2	4.67	2.2
Culling with government employees**	4.44	2.3	3.76	2.3
Reintroducing wolves	4.30	2.3	4.21	2.3
Habitat Improvement Management Actions				
Prescribed burning	5.01	1.9	4.89	1.9
Artificial dams*	4.98	1.9	5.21	1.7
Restoring beavers	5.55	1.7	5.58	1.7

1. Sex coded with 0 = male and 1 = female.
2. Scenarios were coded on a Likert-type scale from 1 (highly unacceptable) to 7 (highly acceptable).

* Based on results of a t-test, males and females were significantly different at $p < .05$

** Based on results of a t-test, males and females were significantly different at $p < .001$.

Table 17. Mean Acceptability of Management Actions Outside RMNP by Sex.[1]

Management alternatives[2]	Sex			
	Males		Females	
	M	SD	M	SD
Fencing Management Actions				
Small-scale, 5-25 yrs***	4.33	2.1	5.11	2.0
Small-scale, 30-50 yrs***	3.91	2.1	4.72	2.1
Large-scale, 5-25 yrs***	3.99	2.1	4.58	2.1
Large-scale, 30-50 yrs***	3.58	2.1	4.23	2.2
Resource Protection Management Actions				
Individual trees chicken wire***	4.05	2.1	4.74	2.2
Individual trees chemicals**	2.85	1.9	2.57	1.8
Log and rock barriers***	3.45	2.1	4.41	2.1
Hazing Techniques				
Hazing with rubber bullets	3.03	2.1	3.10	2.1
Hazing with loud noises	2.72	1.9	2.87	1.9
Hazing using herding dogs***	3.59	2.2	4.51	2.1

Table 17. Continued

Elk Reduction Management Actions				
Permanent contraception***	4.01	2.3	4.43	2.3
Temporary contraception***	4.14	2.2	4.64	2.2
Changing hunting regulations outside RMNP***	6.01	1.5	5.42	2.0
Habitat Improvement Management Actions				
Prescribed burning	4.87	1.9	4.79	2.0
Artificial dams*	4.99	1.8	5.21	1.7
Restoring beavers	5.25	1.7	5.32	1.7

1. Scenarios were coded on a Likert-type scale from 1 (highly unacceptable) to 7 (highly acceptable).
* Based on results of a t-test, males and females were significantly different at $p < .05$
** Based on results of a t-test, males and females were significantly different at $p < .01$.
*** Based on results of a t-test, males and females were significantly different at $p < .001$.

PARTICIPATION IN ACTIVITIES AT ROCKY MOUNTAIN NATIONAL PARK

Respondents were presented with a list of activities possible in RMNP and asked to indicate which activities they had participated in during their most recent trip to RMNP. Results are shown in Table 18. Hiking, auto touring, and wildlife viewing were the activities participated in by the highest percentage of respondents, with just over half reporting having done these. Snowshoeing and skiing were the participated in by the fewest percentage of respondents.

Respondents were also asked to list other activities that were not listed on the survey they had participated in during their most recent trip to RMNP. These results are shown in Table 19.

Table 18. Activities Participated in During Visit to RMNP.

Activity	Percentage of respondents participating
Hiking	57
Auto touring	56
Wildlife viewing	55
Wildlife photography	35
Camping	13
Fishing	10
Climbing	9
Snowshoeing	4
Biking	2
Skiing	2

n = 1508

Table 19. Other Activities Participated in During Visit to RMNP.

Picnicking	37	Scenic photography	3
Horseback riding	19	Viewing aspen / native vegetation	3
Enjoying scenery	18	Astronomical viewing	2
Sightseeing	8	Eating / dining	2
Wildflower viewing / photography	8	Driving through to other destinations	2
Bird watching	7	Family photos	2
Landscape photography	7	General touring of area	2
Short walks	7	Hunter access	2
Relaxing	4	Listening to elk bugle	2
Golfing	3	Motorcycle touring	2
Backpacking	3	Public education / ranger talks	2
Plant / wildflower identification	3	Tubing	2
Running	3	View fall changes	2

Table 20. Activities Listed by Only one Person as Having Participated.

Boating	Sitting by stream / river
Business	Sledding
Check out prescribed burn	Snowboarding
Cookout	Snowmobiling
Family time	Solitude
Got married	Studying geology
Guided tours	Studying Colorado R. ecosystem
Jr. Ranger program	Studying glacial geology
Kayaking	Swimming
Landscape printing	Taking child to camp
Learning about history of the Park	Tennis
Looking at ice formations in July	Trail Ridge snow
Meditation	Tundra flower photography
Outdoor festival	Visiting Moraine Park museum
Painting	Visitor center movie
Photographing snow & scenery	Wandering
Rented cabin	Watching chipmunks
Resting	Watching tourists
Retreat	Work at Bear Lake
Saw bears	Working
Scottish festival	YMCA activities with Girl Scouts
Shopping	Yodeling
Singing John Denver songs with kids	

PLACES VISITED AT ROCKY MOUNTAIN NATIONAL PARK

Respondents were also asked to indicate which places in RMNP they had visited during their most recent trip to RMNP. Some of the more frequently visited areas of the park were shown on a map and respondents were prompted to circle the areas they visited. The results of the responses are shown in Table 21. The Alpine Visitor Center, Horseshoe Park, Beaver Meadows, Moraine Park, and the Fall River Entrance were the areas listed as being visited by the highest percentage of respondents, with about 40% of respondents indicating they had visited them. Respondents were also asked to list other areas not shown on the map that they had visited on their most recent trip to RMNP. Results of these listings are shown in Table 21. Finally, Table 22 shows those places listed by only one person as having been visited during their most recent trip to RMNP.

Table 21. Areas visited in and around RMNP.

Area visited	Percentage of respondents
Alpine Visitor Center	42
Horseshoe Park	41
Beaver Meadows	40
Moraine Park	39
Fall River Entrance	38
Beaver Meadows Visitor Center	33
Bear Lake	32
Trail Ridge Road	31
Estes Park	27
Kawuneeche Valley	26
Kawuneeche Visitor Center	26
Fall River Road	25
Grand Lake	20

n = 1462

Table 22. Other Places Respondents Visited on Their Most Recent Trip to RMNP.

Wild Basin	58	Chasm Lake	3
Sprague Lake	41	Colo. River Headwaters	3
Longs Peak	32	Coyote Valley Trail	3
Lily Lake	29	Deer Mountain	3
Gem Lake	13	Emerald Lake	3
Mills Lake	11	Flat Top Mt.	3
Fern Lake	10	Green Mt. Trail	3
Endovalley	9	Lake Haiyaha	3
McGraw Ranch	9	Lake Odessa	3
Neversummer Ranch	9	Lawn Lake	3
Alluvial Fan	8	Lulu City	3
Colorado River Trail	8	Mummy Range	3
Cub Lake	7	North Fork	3
Lumpy Ridge	7	The Pool	3
Ouzel Falls	7	Timber Creek	3
Twin Sisters	7	Ute Trail	3
Milner Pass	6	Bierstadt Lake	2
Bridal Veil Falls	5	Big Meadow	2
Glacier Basin	5	Bighorn Flats	2
Hollowell Park	5	Black Canyon	2
Adams Falls	4	Black Lake	2
Cow Creek	4	Bowen Lake	2
Dream Lake	4	Devil's Head	2
Glacier Gorge	4	Farview Curve	2
Hidden Valley	4	Lake Irene	2
Indian Peaks	4	Mirror Lake	2
Mt. Ida	4	Moraine Park Museum	2
Nymph Lake	4	Poudre Lake	2
Sky Pond	4	Specimen Mountain	2
Alberta Falls	3		

Table 23. Areas Listed by Only one Person as Having been Visited on the Most Recent trip to RMNP.

Arapahoe wildlife areas	Gast Inlet	Onahu
Arrowhead Lakes	George Lakes	Sandbeach Lake
Aspen Glen	Hague Creek area	Shadow Mountain
Beaver Ponds	Hallett Peak	Sheep Lake
Bowen / Baker Trailhead	Haberson Meadow	Sheep Meadow
Brainard Lake	Jennings Bridge	South Park
Calypso Cascades	Lacon Lake	Spearhead
Cascade Falls Trail	Lake Estes	Sprague Lake stables
Chadin Pass	Lily Lake Visitor Center	Spruce Lake
Chapin Creek Trail	Loch Lake	Storm Pass Trail
Clear Creek Reservoir	Lock Vail	The Loch
Copeland Falls	Longs Peak Trailhead	Timber Lake
Eagle Cliff	Lower Beaver Meadows	Tonahutu Spur
East Inlet Trail	Many Parks Curve	Tonghut
Eastern Boundary Trail	McGregor Ranch	Twin Owls
Estes Cone	Moraine Park Campground	Upper St. Vrain
Fall River Picnic Area	Needles	West Creek Trail
Flechute Cabin	North Boundary	Ypsilon Lake
Forest Canyon Overlook		

WILDLIFE VIEWING TYPOLOGIES

Within recent years, non-consumptive behavior towards wildlife has been increasing in popularity. The 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation reported that 31 percent of respondents participated in wildlife-watching (USDI Fish and Wildlife Service, 2001). With this popularity comes the issue of how to manage for wildlife viewing related recreation activities. In an attempt to assist managers in this endeavor, Manfredo and Larson (1993) surveyed wildlife viewers in the Denver metropolitan area to measure wildlife viewing experiences. Results indicated four different groups of wildlife viewing experience types. Summaries of the characteristics of these wildlife viewers follow.

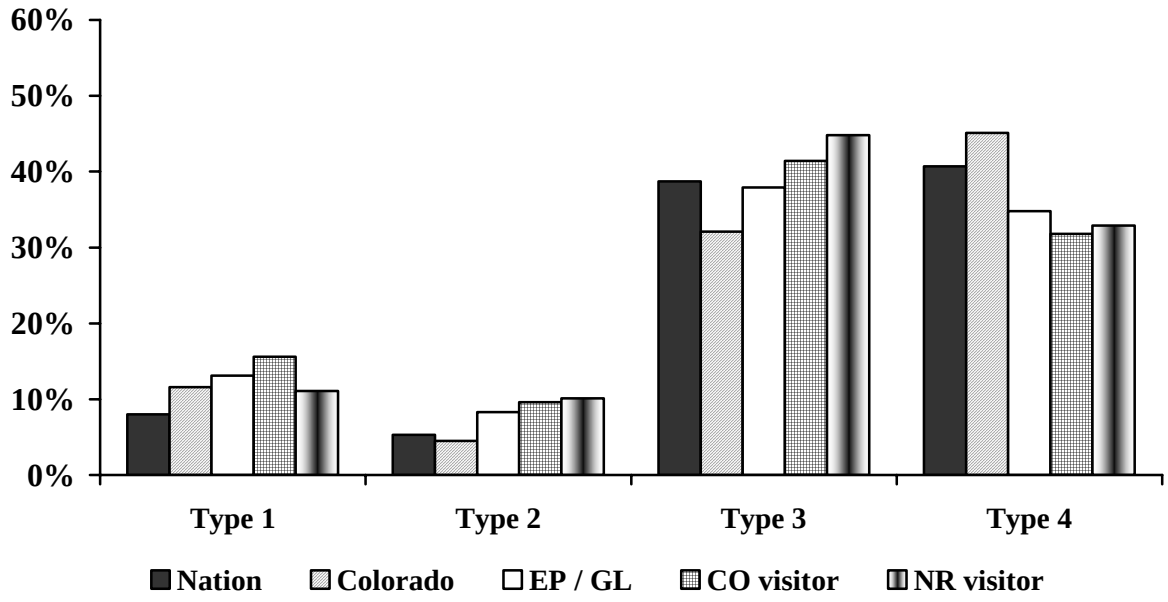
> Type 1: a person who is highly interested in wildlife viewing. They take several wildlife viewing trip throughout the year and they enjoy opportunities to study wildlife and its behavior and opportunities to teach and lead others.
>
> Type 2: a person who is very active and interested in wildlife but values the opportunity to photograph, paint or sketch wildlife. These people of often have high investment in equipment such as camera gear.
>
> Type 3: a person with a general interest in seeing and learning about wildlife. They take trips to see wildlife sporadically throughout the year and do so to have a change of pace, to get out with friends or family or just to see new scenery.
>
> Type 4: a person who has a slight level of interest in trips specifically to view wildlife. Only occasionally do they take wildlife viewing trips. They primary means by which they enjoy wildlife is when it is associated with other types of activities such as auto driving, camping, walking, or fishing.

We presented these four viewing types to respondents and asked them to read the description of each type and indicate which type best described them. Overall results are shown in Table 24. When broken down according to strata (Figure 49), trends of wildlife viewing typologies generally followed those in Table 24, with the highest percentage of respondents identifying themselves as wildlife viewers best described as Type 3, followed by Type 4. A higher percentage of Colorado residents, however, identified with Type 4 than with Type 3.

Table 24. Wildlife Viewing Typologies.

Wildlife viewing typology	Percentage of respondents of each type
Type 1	13%
Type 2	9%
Type 3	41%
Type 4	35%
None of these	4%

n = 1459



1. % of respondents identifying themselves as a given type of wildlife viewer.
2. Data weighted by "Humans should manage wild animal populations so that humans benefit".
3. n = 150 for national residents, n = 224 for Colorado residents, n = 290 for Estes Park / Grand Lake residents, n = 365 for Colorado resident visitors, and n = 395 for non-resident visitors.

Figure 49. Wildlife Viewing Typology by Strata.

In addition to wildlife viewing typologies, we asked respondents to rate the importance of wildlife viewing in RMNP in relation to other aspects of their visit on their most recent trip to the park. These results are shown in Table 25. As indicated, most respondents rated wildlife viewing as equally important as other aspects of their trip to RMNP.

Table 25. Importance of Viewing Wildlife in RMNP.

Viewing wildlife compared to other aspects of my visit to RMNP was:	
Much less important	5%
Less important	22%
Equally important	48%
More important	9%
Much more important	12%
Viewing wildlife was not important	3%

1% of respondents were not sure how important viewing wildlife was compared to other aspects of their trip.
n = 1260

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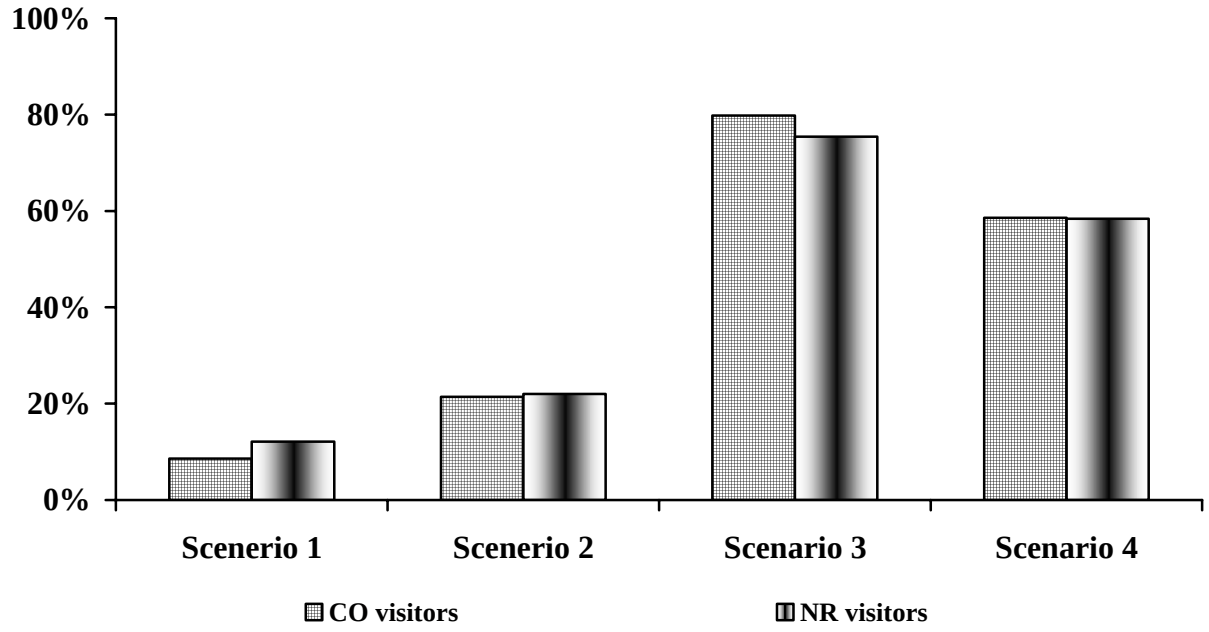
APPENDIX A –RESPONSES TO KEY QUESTIONS, UNWEIGHTED

Acceptability of hypothetical future scenarios



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 365 and 372 for Colorado visitors and between 399 and 405 for non-resident visitors.
3. Chi values: Scenario 1, $\chi^2 = 2.71$, sig. = .26; Scenario 2, $\chi^2 = 2.82$, sig. = .24; Scenario 3, $\chi^2 = 4.74$, sig. = .09; Scenario 4, $\chi^2 = .02$, sig. = .99.

Figure 1a. Acceptability of Hypothetical Future Scenarios of Elk and Vegetation in RMNP, Visitors.

Most preferred alternative

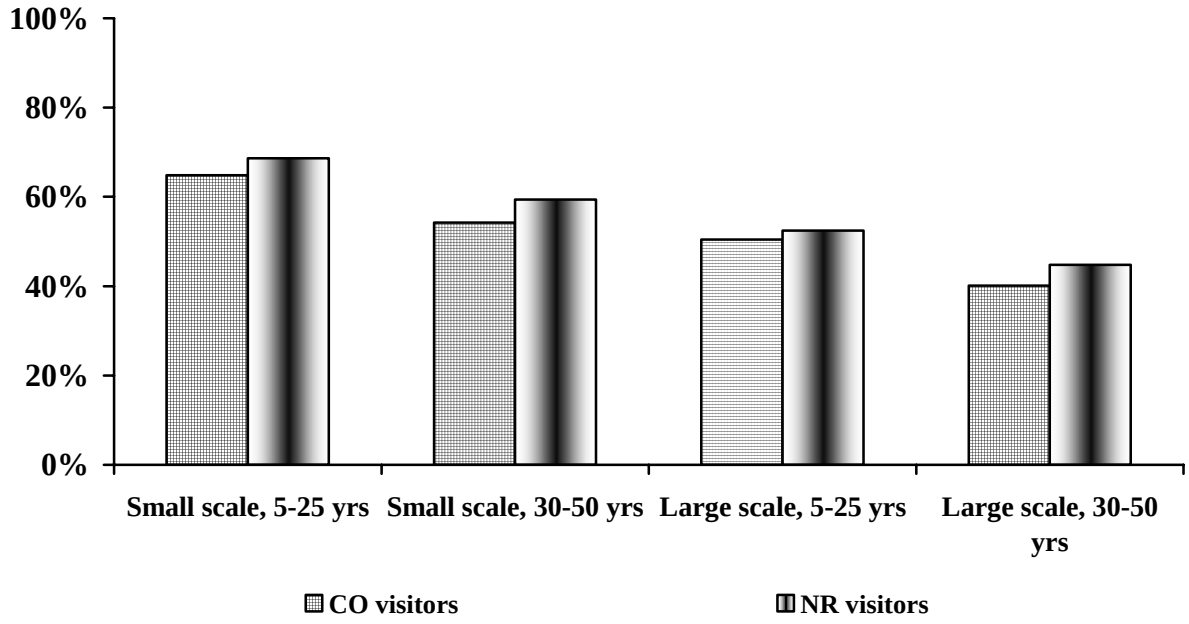
Table 1a. Preference and opposition to management scenario—unweighted

	Most preferred scenario				Most opposed scenario			
Strata[1]	1	2	3	4	1	2	3	4
National	1.9	7.1	54.5	36.5	76.1	1.8	.9	21.1
Colorado	3.6	4.9	49.1	42.0	76.9	1.3	1.3	20.5
Estes Park / Grand Lake	1.4	8.0	50.5	40.1	74.9	1.3	.4	23.3
Colorado visitors	1.6	9.6	58.1	30.7	75.5	1.4	.0	23.0
Non-resident visitors	2.8	8.8	57.8	30.8	72.2	1.3	.6	25.9

[1] n = 156 and 109, respectively for national residents; n = 224 and 156, respectively for Colorado residents; n = 289 and 223, respectively for Estes Park/Grand Lake residents; n = 365 and 282, respectively for Colorado visitors; and n = 400 and 309, respectively for non-resident visitors.

Acceptability of management actions *in* RMNP

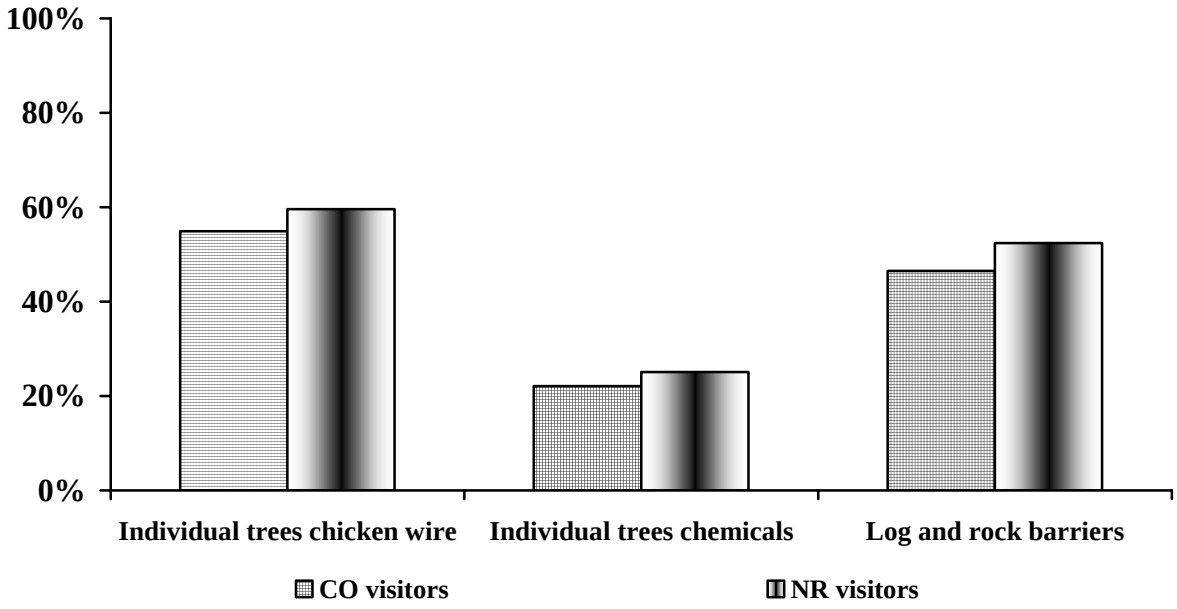
Fencing in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 365 and 372 for Colorado visitors and between 397 and 401 for non-resident visitors.
3. Chi values: Small-scale, 5-25, $\chi^2 = 4.18$, sig. = .12; Small-scale, 30-50, $\chi^2 = 2.38$, sig. = .30; Large-scale, 5-25, $\chi^2 = .52$, sig. = .77; Large-scale 30-50, $\chi^2 = 2.78$, sig. = .25.

Figure 2a. Acceptability of Fencing Management Actions in RMNP, Visitors.

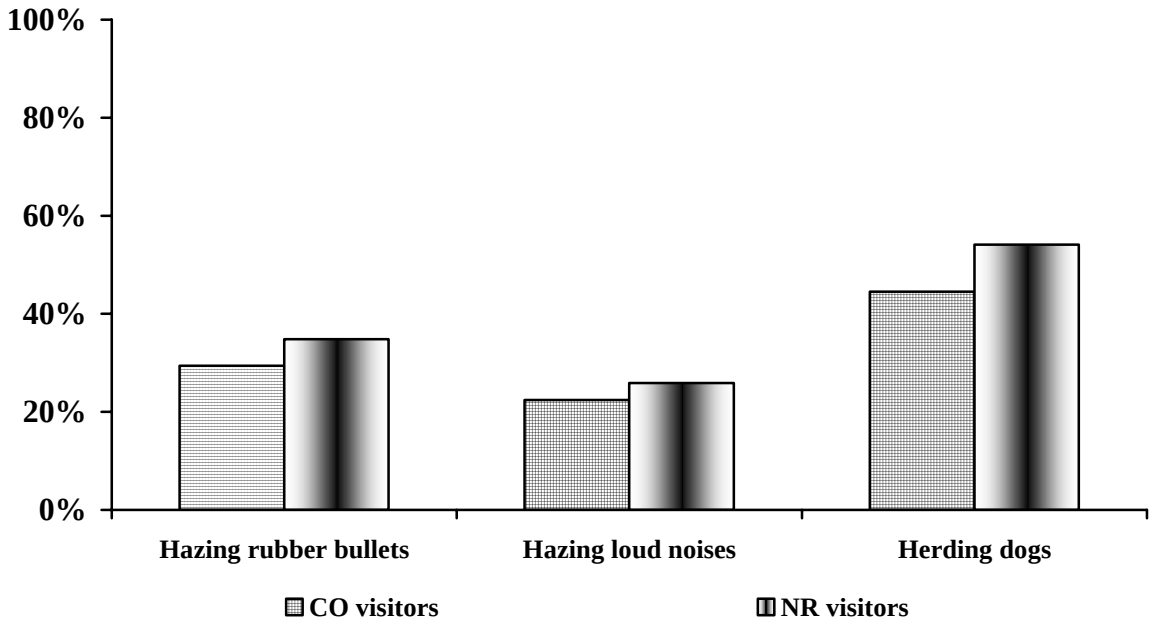
Resource protection in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 375 and 376 for Colorado visitors and between 414 and 415 for non-resident visitors.
3. Chi values: Chicken wire, $\chi^2 = 4.04$, sig. = .13; Chemicals, $\chi^2 = 1.01$, sig. = .60; Barriers, $\chi^2 = 3.17$, sig. = .21.

Figure 3a. Acceptability of Resource Protection Management Activities in RMNP, Visitors.

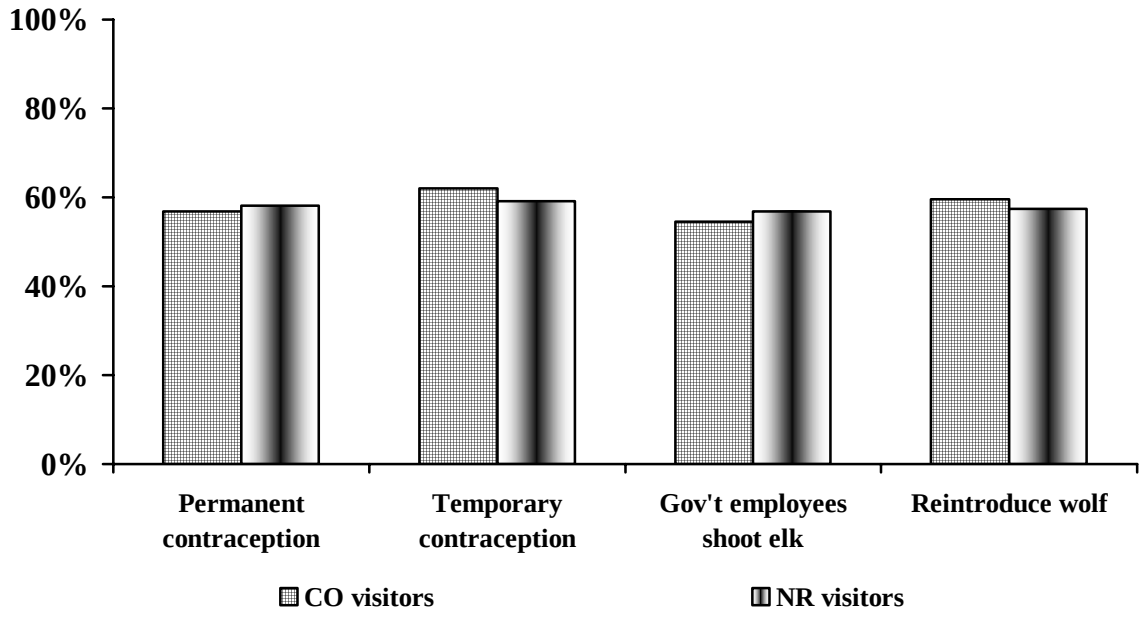
Hazing techniques in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 370 and 375 for Colorado visitors and between 413 and 414 for non-resident visitors.
3. Chi values: Hazing with bullets, $\chi^2 = 3.70$, sig. = .16; Hazing with noise, $\chi^2 = 6.42$, sig. = .04; Herding dogs, $\chi^2 = 8.38$, sig. = .02.

Figure 4a. Acceptability of Hazing Techniques in RMNP, Visitors.

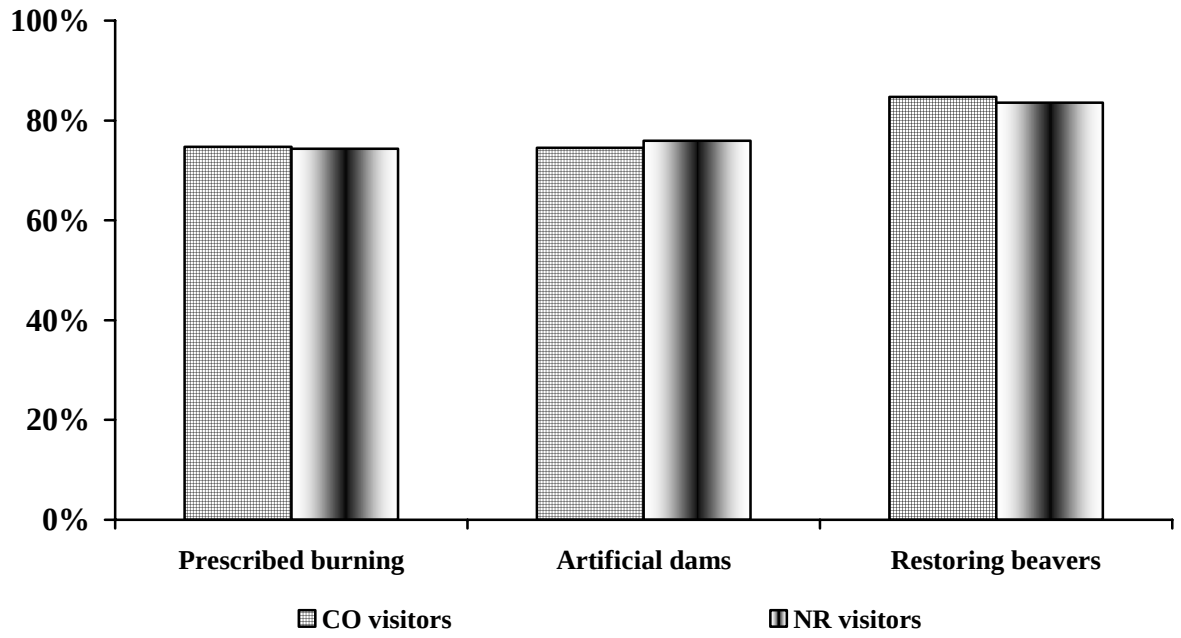
Methods to reduce elk numbers in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 374 and 376 for Colorado visitors and between 411 and 416 for non-resident visitors.
3. Chi values: Perm contraception, $\chi^2 = .56$, sig. = .76; Temp contraception, $\chi^2 = .77$, sig. = .68; Shoot elk, $\chi^2 = .51$, sig. = .76; Reintroduce wolf, $\chi^2 = .47$, sig. = .79.

Figure 5a. Acceptability of Management Actions that Reduce Elk Numbers in RMNP, Visitors.

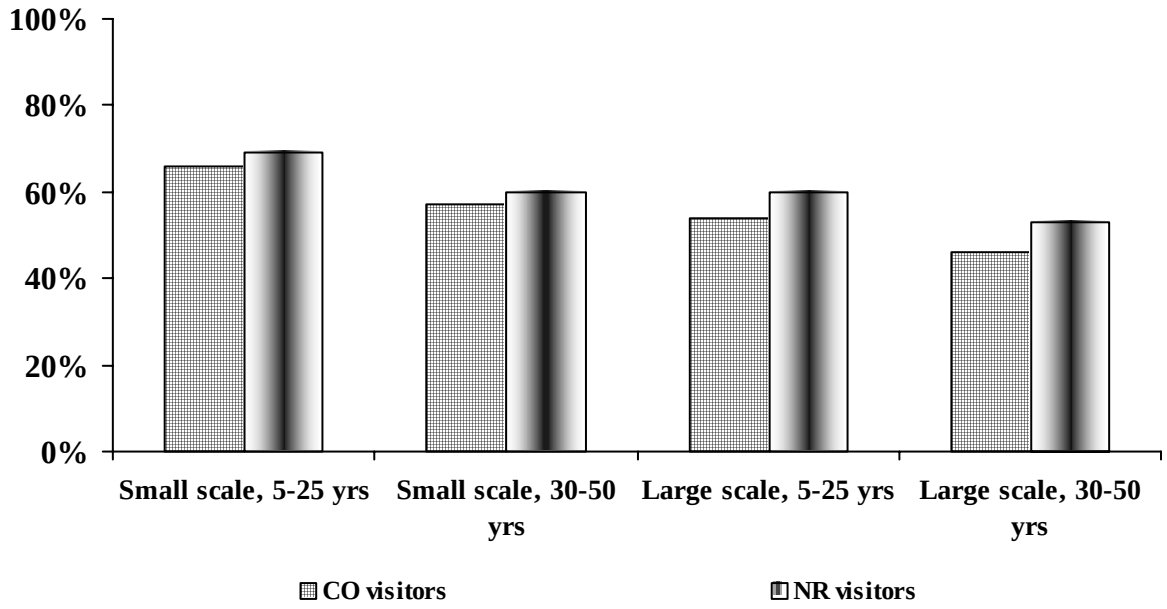
Habitat improvements in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 357 and 364 for Colorado visitors and between 372 and 375 for non-resident visitors.
3. Chi values: Burning, $\chi^2 = .06$, sig. = .97; Dams, $\chi^2 = .20$, sig. = .90; Beavers, $\chi^2 = .51$, sig. = .78.

Figure 6a. Acceptability of Habitat Improvement Management Actions in RMNP, Visitors.

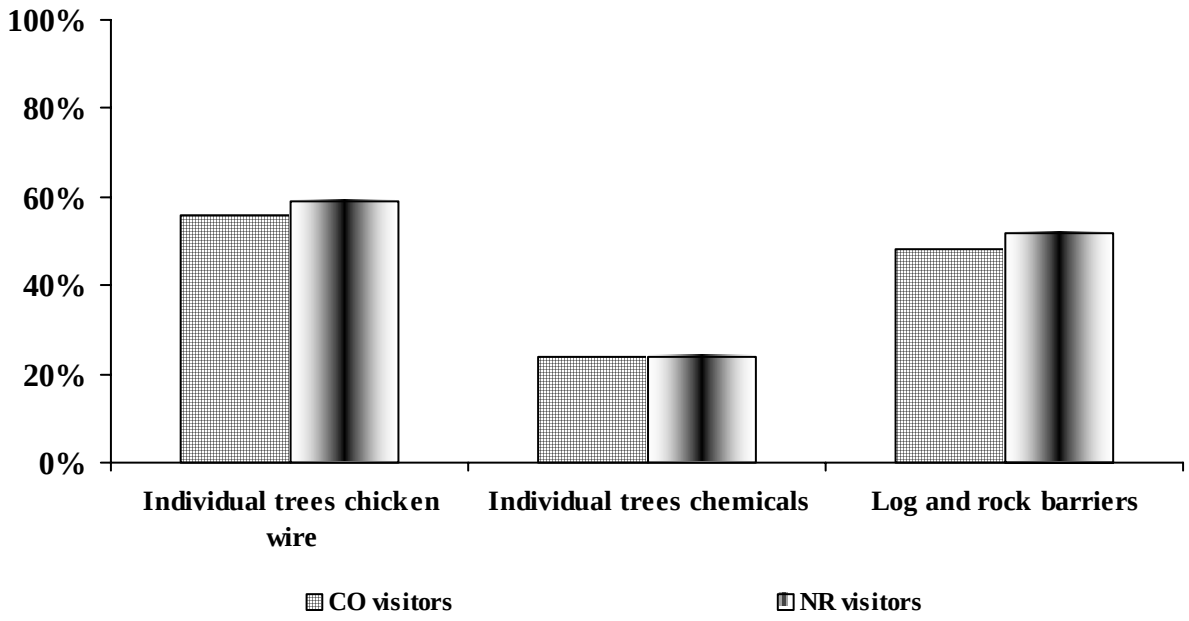
Fencing outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 364 and 369 for Colorado visitors and between 397 and 401 for non-resident visitors.
3. Chi values: Small-scale, 5-25, $\chi^2 = 1.79$, sig. = .41; Small-scale, 30-50, $\chi^2 = .91$, sig. = .63; Large-scale, 5-25, $\chi^2 = 2.50$, sig. = .29; Large-scale 30-50, $\chi^2 = 6.04$, sig. = .05.

Figure 7a. Acceptability of Fencing Management Actions outside RMNP, Visitors.

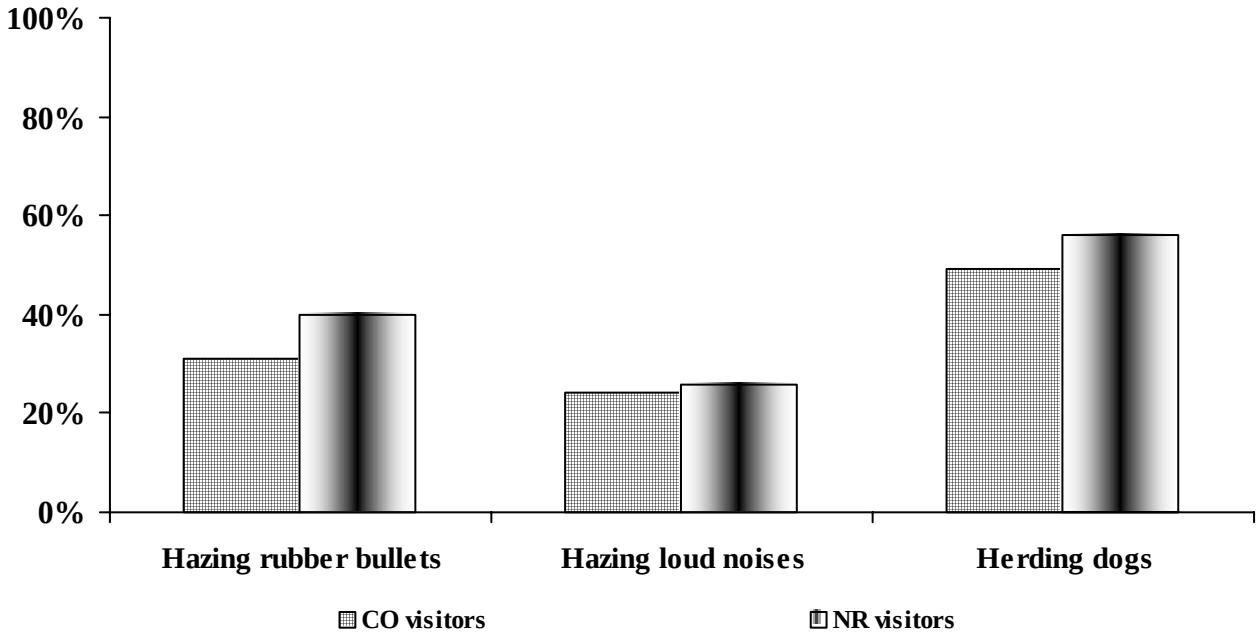
Resource protection outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 368 and 371 for Colorado visitors and between 408 and 413 for non-resident visitors.
3. Chi values: Chicken wire, $\chi^2 = 1.86$, sig. = .39; Chemicals, $\chi^2 = .18$, sig. = .91; Barriers, $\chi^2 = 2.14$, sig. = .34.

Figure 8a. Acceptability of Resource Protection Management Activities outside RMNP, Visitors.

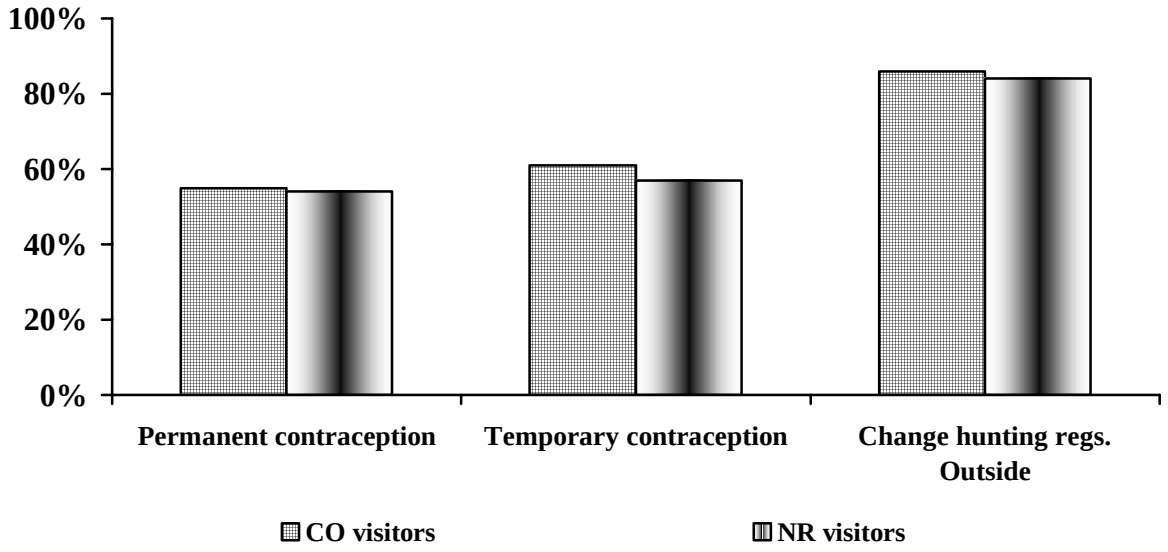
Hazing techniques outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 364 and 369 for Colorado visitors and between 410 and 413 for non-resident visitors.
3. Chi values: Hazing with bullets, $\chi^2 = 9.45$, sig. = .009; Hazing with noise, $\chi^2 = 7.27$, sig. = .03; Herding dogs, $\chi^2 = 5.33$, sig. = .07.

Figure 9a. Acceptability of Hazing Techniques outside RMNP, Visitors.

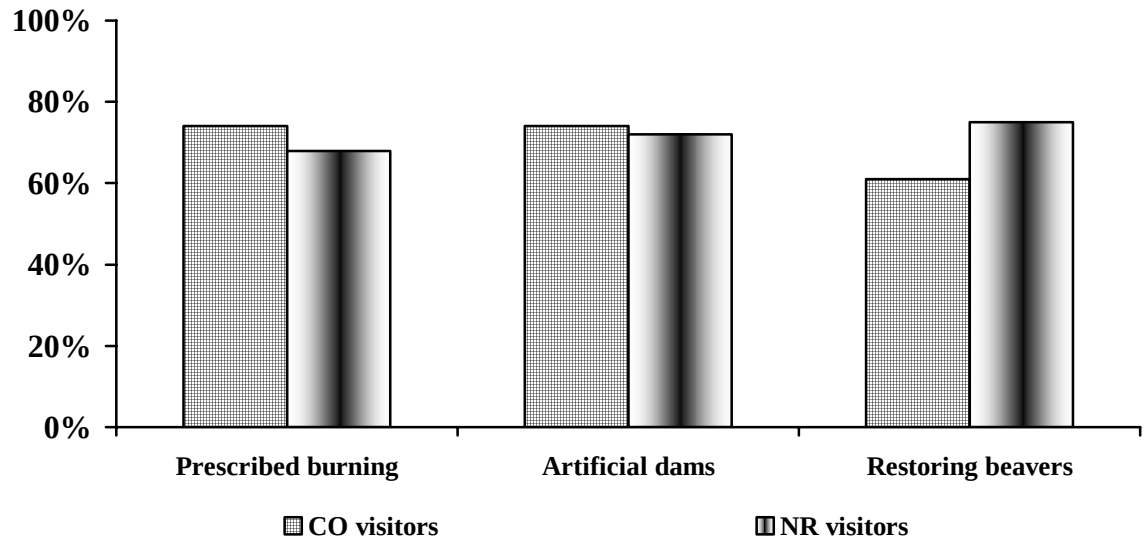
Methods to reduce elk numbers outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 368 and 374 for Colorado visitors and between 411 and 414 for non-resident visitors.
3. Chi values: Perm contraception, $\chi^2 = 3.80$, sig. = .15; Temp contraception, $\chi^2 = 1.93$, sig. = .38; Shoot elk, $\chi^2 = 1.60$, sig. = .45.

Figure 10a. Acceptability of Management Actions that Reduce Elk Numbers outside RMNP, Visitors.

Habitat improvements outside RMNP

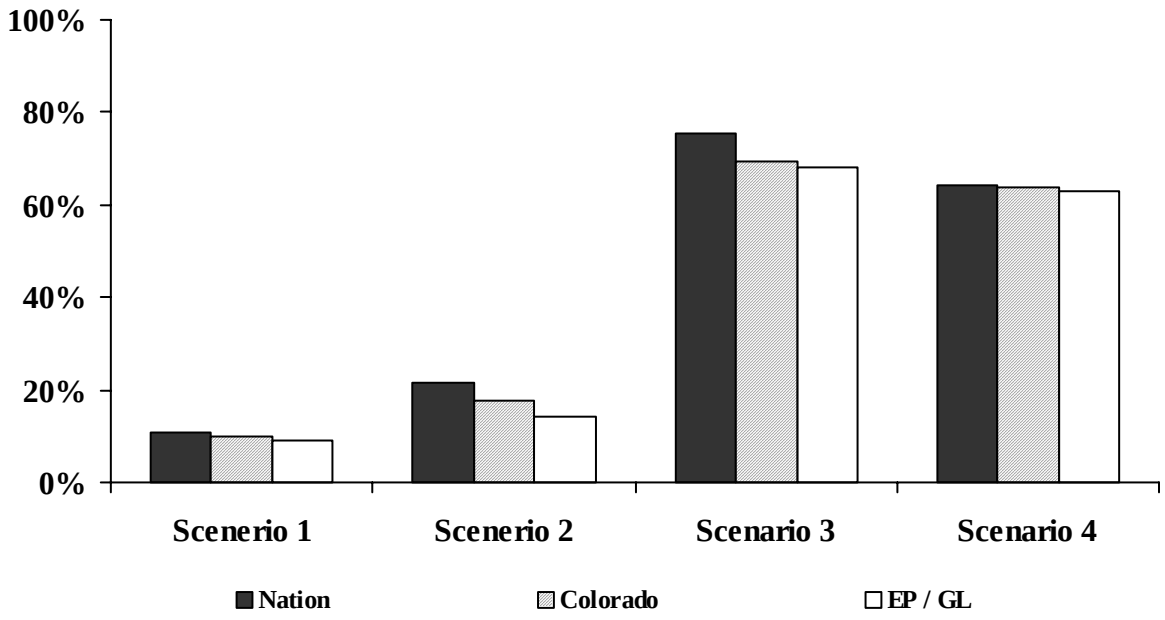


1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 367 and 368 for Colorado visitors and between 408 and 413 for non-resident visitors.
3. Chi values: Burning, $\chi^2 = 3.52$, sig. = .17; Dams, $\chi^2 = 1.43$, sig. = .49; Beavers, $\chi^2 = 4.04$, sig. = .16.

Figure 11a. Acceptability of Habitat Improvement Management Actions outside RMNP, Visitors.

National, Colorado, and Estes Park / Grand Lake general population strata

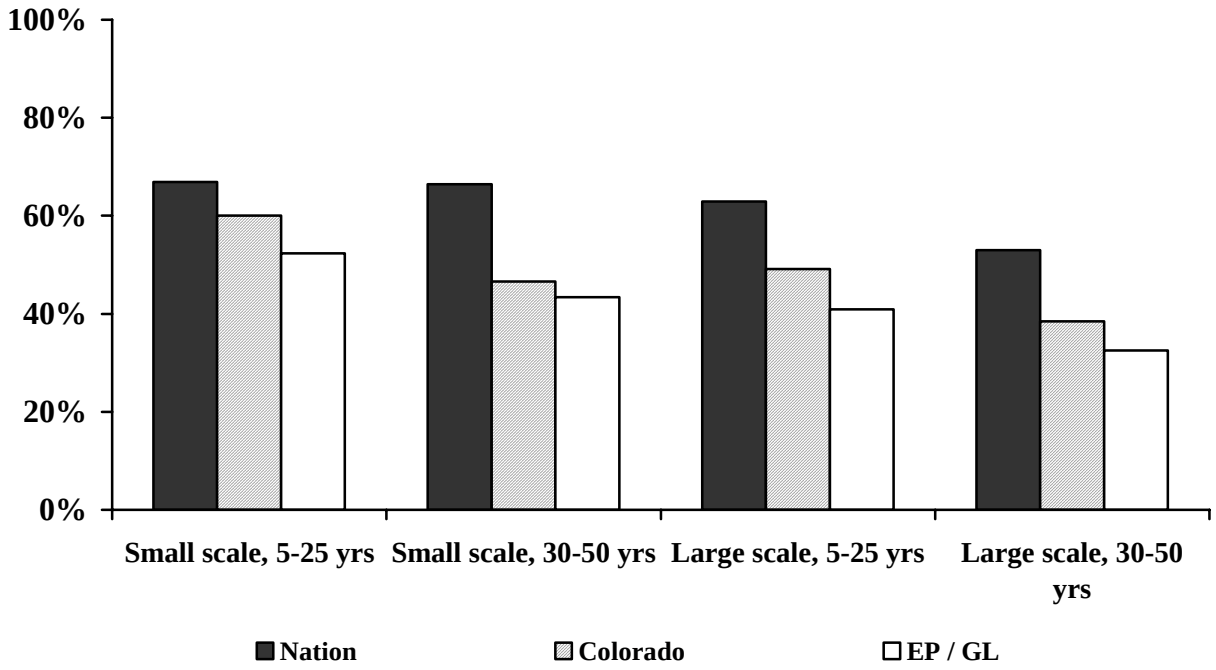
Acceptability of Hypothetical Future Scenarios



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 154 and 158 for national residents, between 225 and 227 for Colorado residents, and between 290 and 293 for Estes Park / Grand Lake residents.
3. Chi values: Scenario 1, $\chi^2 = 1.50$, sig. = .83; Scenario 2, $\chi^2 = 7.76$, sig. = .10; Scenario 3, $\chi^2 = 12.03$, sig. = .02; Scenario 4, $\chi^2 = 5.73$, sig. = .22.

Figure 12a. Acceptability of Hypothetical Future Scenarios of Elk and Vegetation in RMNP, Resident Strata.

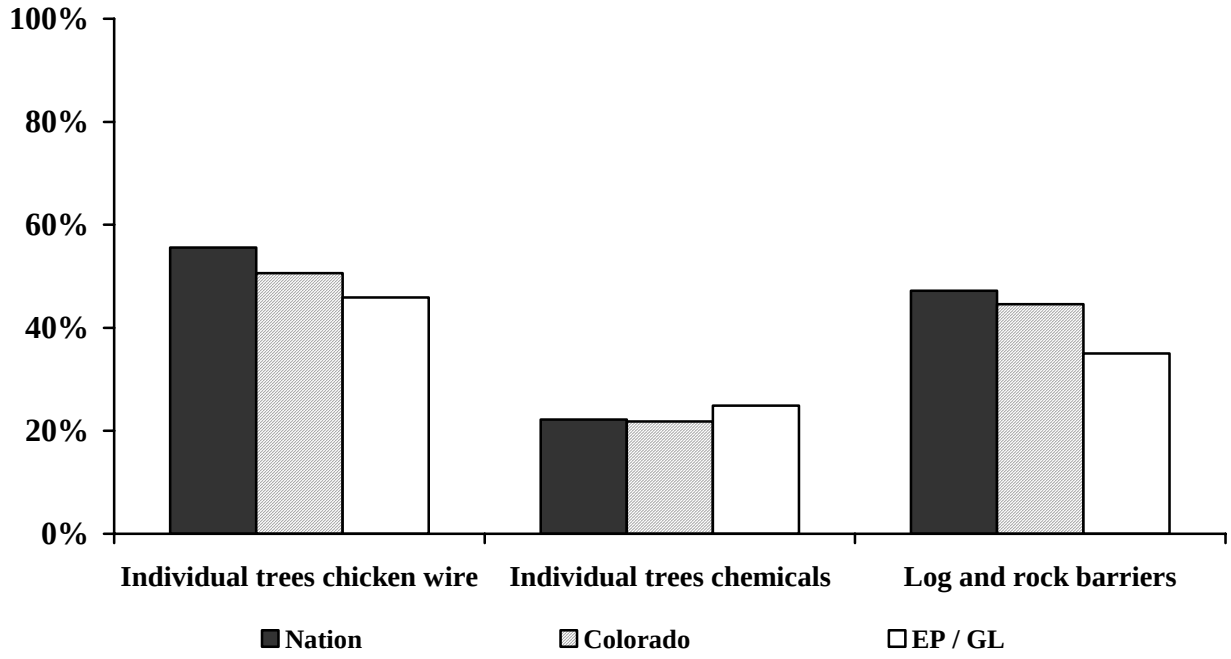
Fencing in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 149 and 154 for national residents, between 219 and 225 for Colorado residents, and between 279 and 287 for Estes Park / Grand Lake residents.
3. Chi values: Small-scale, 5-25, $\chi^2 = 12.12$, sig. = .02; Small-scale, 30-50, $\chi^2 = 26.63$, $p < .001$; Large-scale, 5-25, $\chi^2 = 24.94$, $p < .001$; Large-scale 30-50, $\chi^2 = 23.07$, $p < .001$.

Figure 13a. Acceptability of Fencing Management Actions in RMNP, Resident Strata.

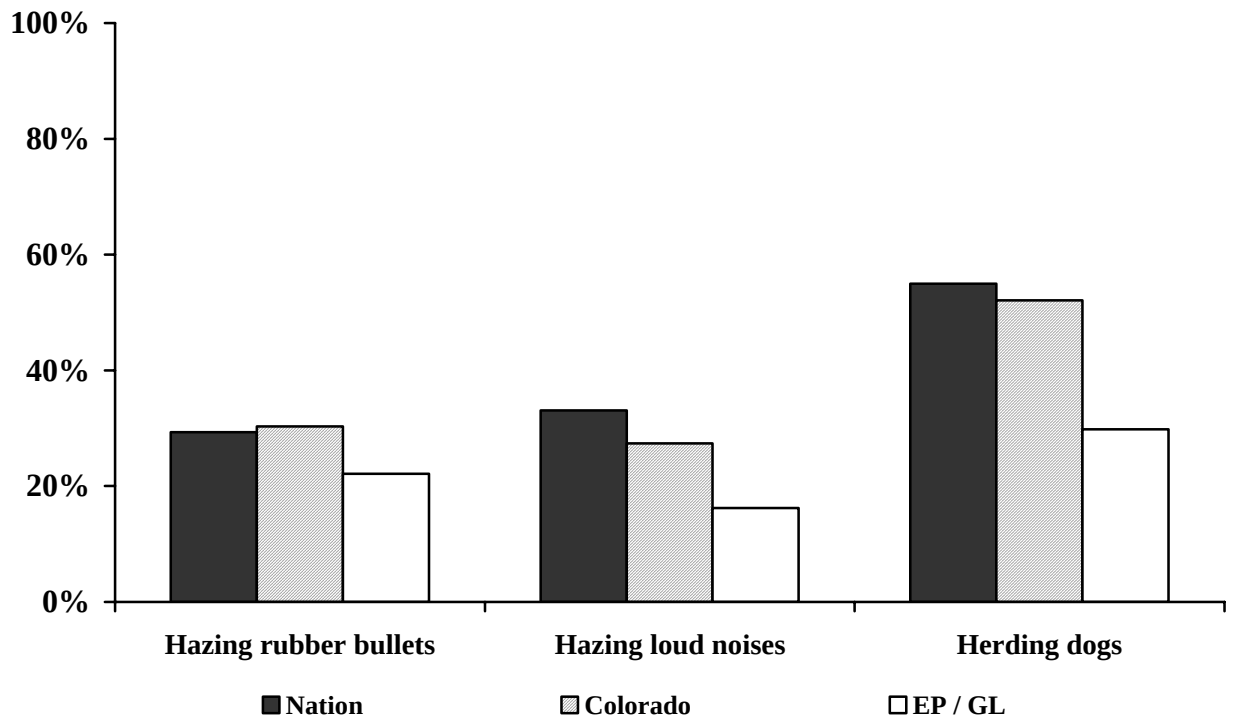
Resource Protection in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 158 and 161 for national residents, between 233 and 235 for Colorado residents, and between 296 and 298 for Estes Park / Grand Lake residents.
3. Chi values: Chicken wire, $\chi^2 = 6.41$, sig. = .17; Chemicals, $\chi^2 = 1.04$, sig. = .90; Barriers, $\chi^2 = 12.55$, sig. = .01.

Figure 14a. Acceptability of Resource Protection Management Activities in RMNP, Resident Strata.

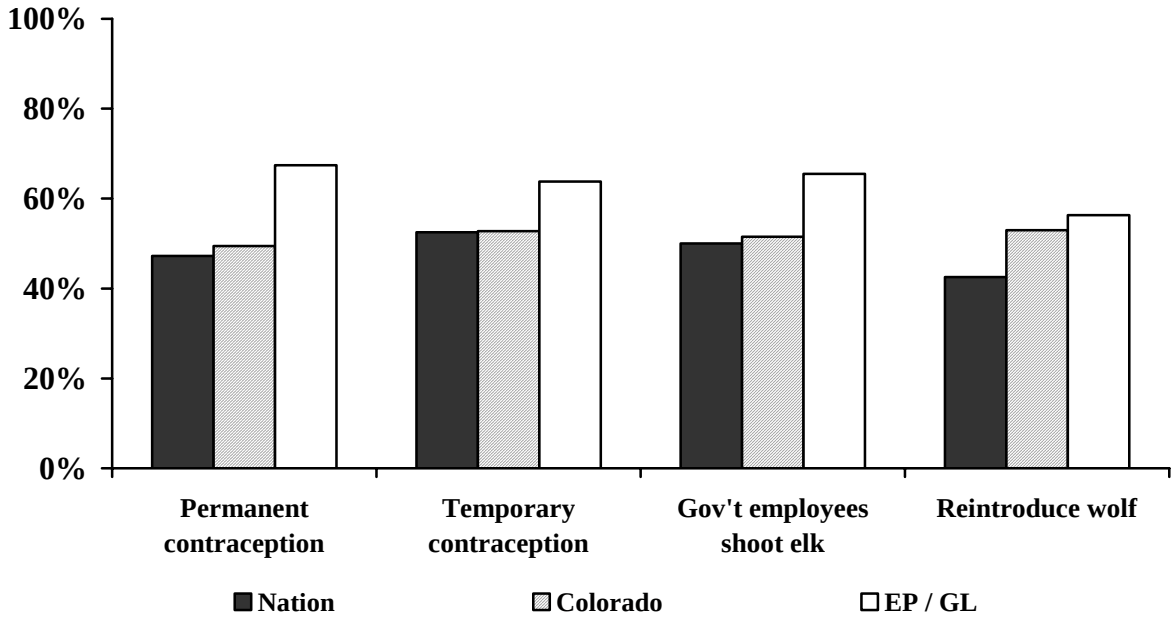
Hazing techniques in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 157 and 160 for national residents, n = 234 for Colorado residents, and range between 294 and 299 for Estes Park / Grand Lake residents.
3. Chi values: Hazing with bullets, $\chi^2 = 6.55$, sig. = .16; Hazing with noise, $\chi^2 = 29.16$, $p < .001$; Herding dogs, $\chi^2 = 42.31$, $p < .001$.

Figure 15a. Acceptability of Hazing Techniques in RMNP, Resident Strata.

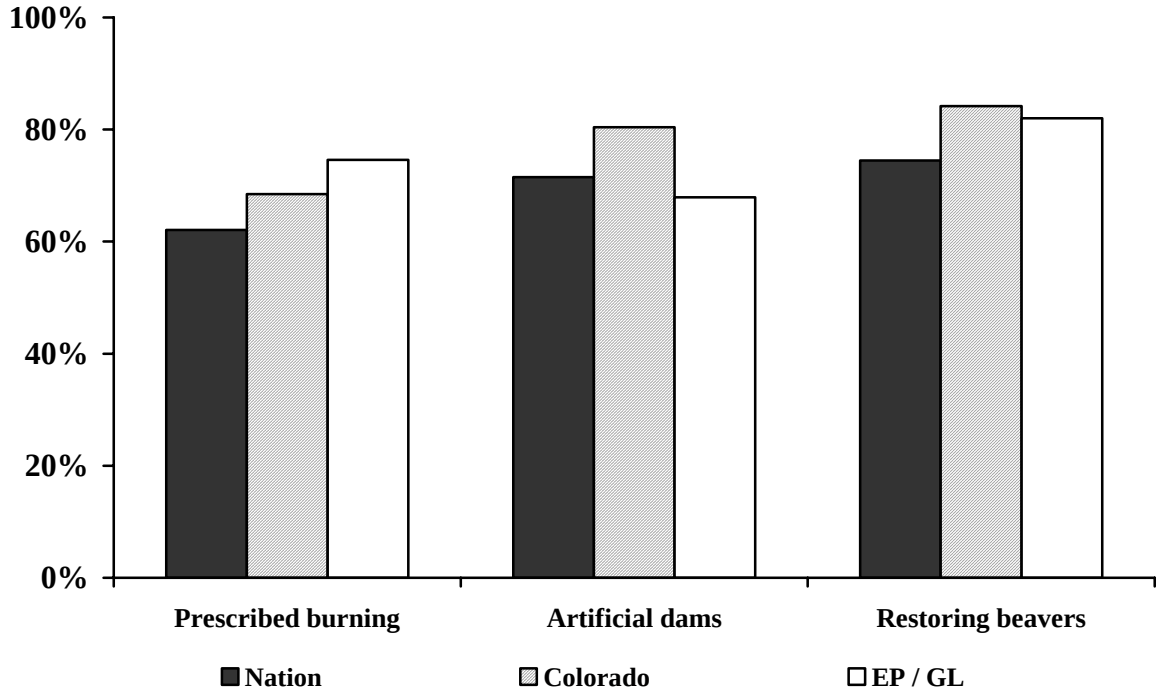
Methods to reduce elk numbers in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 158 and 161 for national residents, between 232 and 235 for Colorado residents, and between 293 and 298 for Estes Park / Grand Lake residents.
3. Chi values: Perm contraception, $\chi^2 = 25.70$, $p < .001$; Temp contraception, $\chi^2 = 10.07$, sig. = .04; Shoot elk, $\chi^2 = 16.08$, sig. = .003; Reintroduce wolf, $\chi^2 = 8.95$, sig. = .06.

Figure 16a. Acceptability of Management Actions that Reduce Elk Numbers in RMNP, Resident Strata.

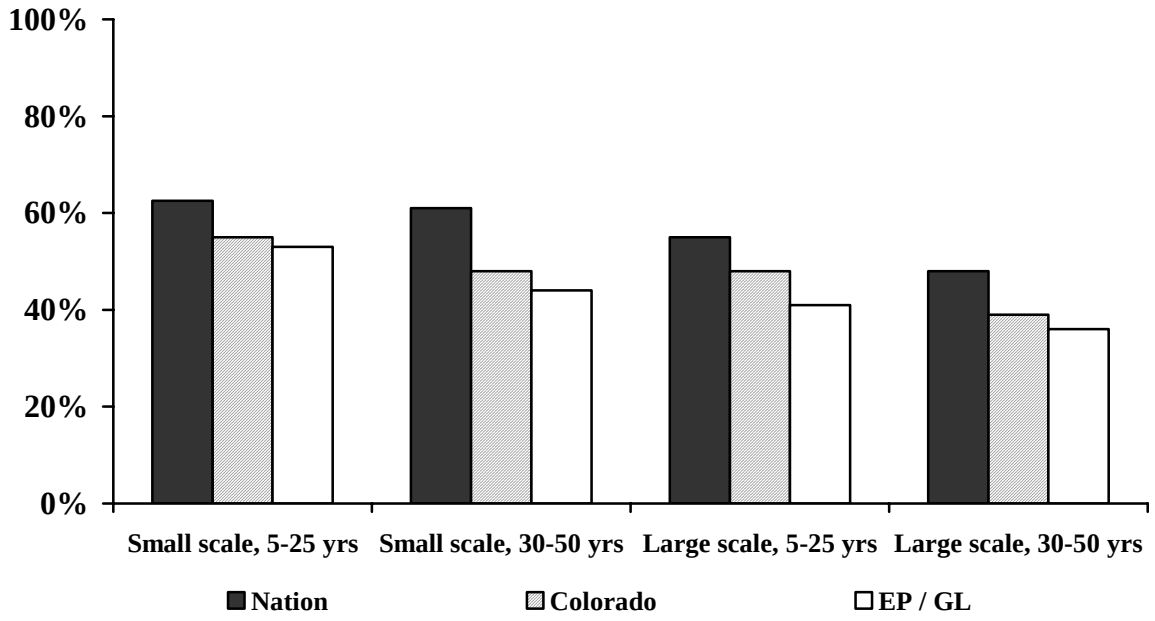
Habitat improvements in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 158 and 161 for national residents, between 230 and 234 for Colorado residents, and between 295 and 296 for Estes Park / Grand Lake residents.
3. Chi values: Burning, $\chi^2 = 15.01$, sig. = .005; Dams, $\chi^2 = 16.72$, sig. = .002; Beavers, $\chi^2 = 8.59$, sig. = .07.

Figure 17a. Acceptability of Habitat Improvement Management Actions in RMNP, Resident Strata.

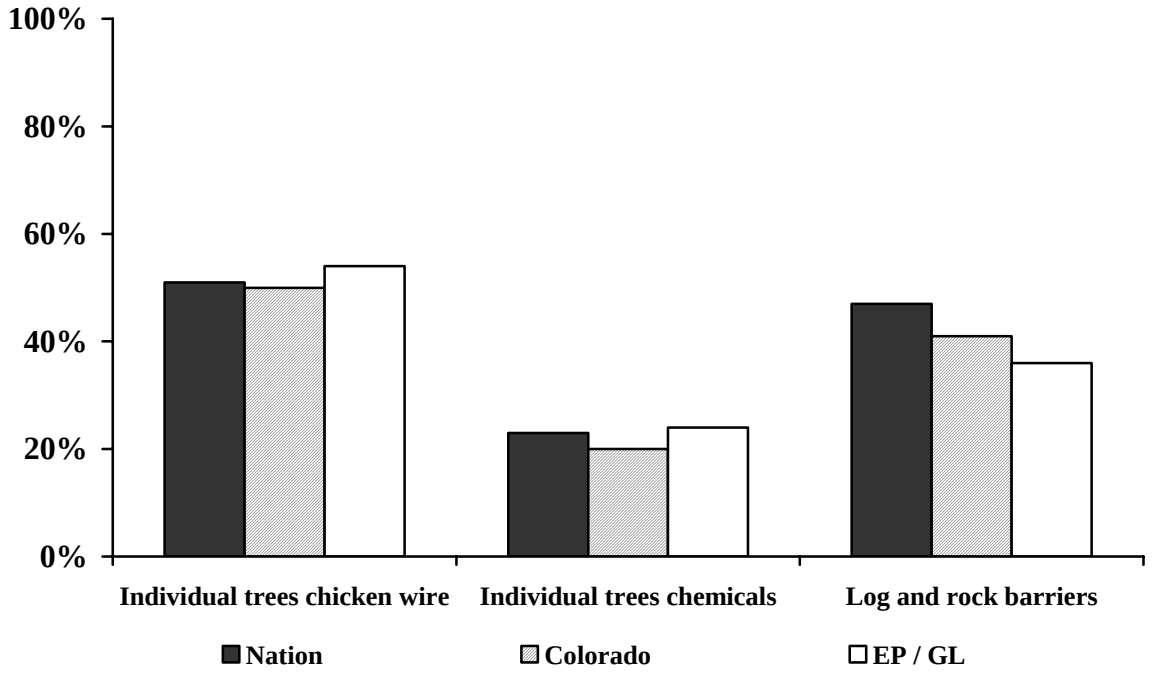
Fencing outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 149 and 152 for national residents, between 217 and 222 for Colorado residents, and between 276 and 284 for Estes Park / Grand Lake residents.
3. Chi values: Small-scale, 5-25, $\chi^2 = 10.14$, sig. = .04; Small-scale, 30-50, $\chi^2 = 17.93$, sig. = .001; Large-scale, 5-25, $\chi^2 = 18.01$, sig. = .001; Large-scale 30-50, $\chi^2 = 14.13$, sig. = .007.

Figure 18a. Acceptability of Fencing Management Actions outside RMNP, Resident Strata.

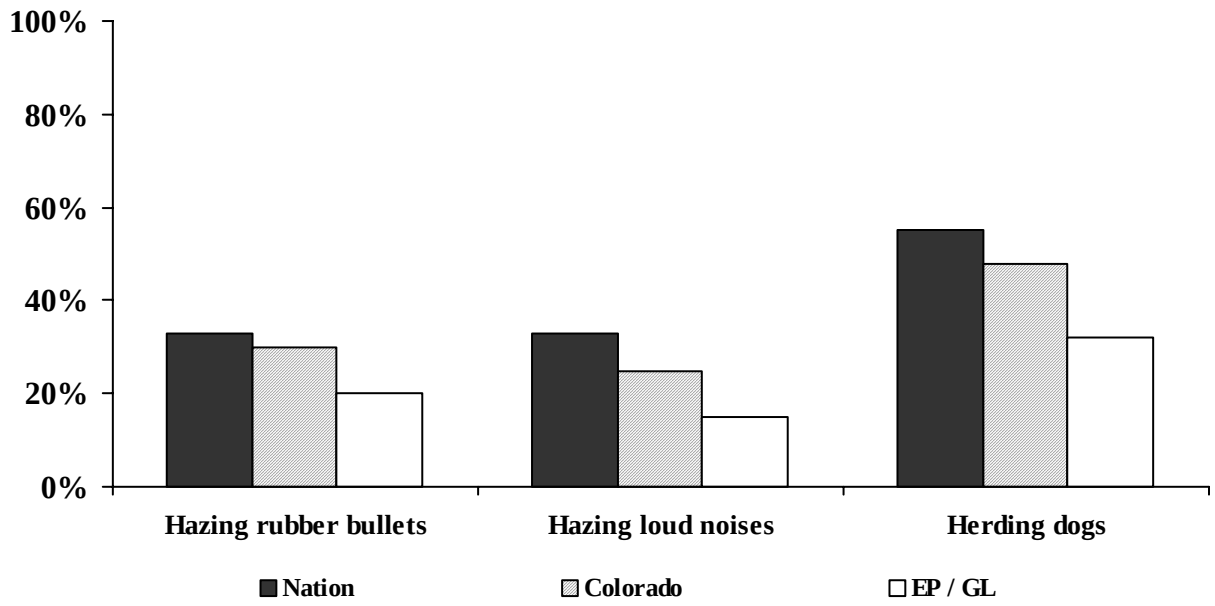
Resource protection outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 157 and 159 for national residents, between 228 and 231 for Colorado residents, and between 293 and 298 for Estes Park / Grand Lake residents.
3. Chi values: Chicken wire, $\chi^2 = 6.48$, sig. = .17; Chemicals, $\chi^2 = 1.42$, sig. = .84; Barriers, $\chi^2 = 9.36$, sig. = .05.

Figure 19a. Acceptability of Resource Protection Management Activities outside RMNP, Resident Strata.

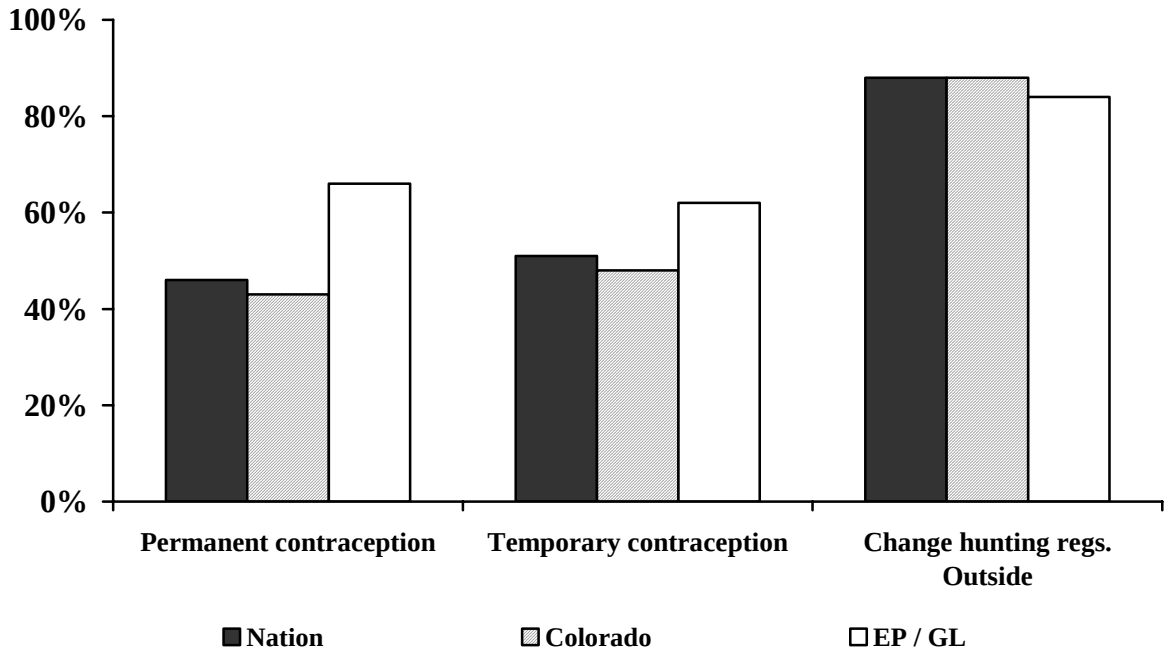
Hazing techniques outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 156 and 158 for national residents, between 228 and 231 for Colorado residents, and between 293 and 298 for Estes Park / Grand Lake residents.
3. Chi values: Hazing with bullets, $\chi^2 = 11.35$, sig. = .02; Hazing with noise, $\chi^2 = 35.95$, $p < .001$; Herding dogs, $\chi^2 = 34.16$, $p < .001$.

Figure 20a. Acceptability of Hazing Techniques outside RMNP.

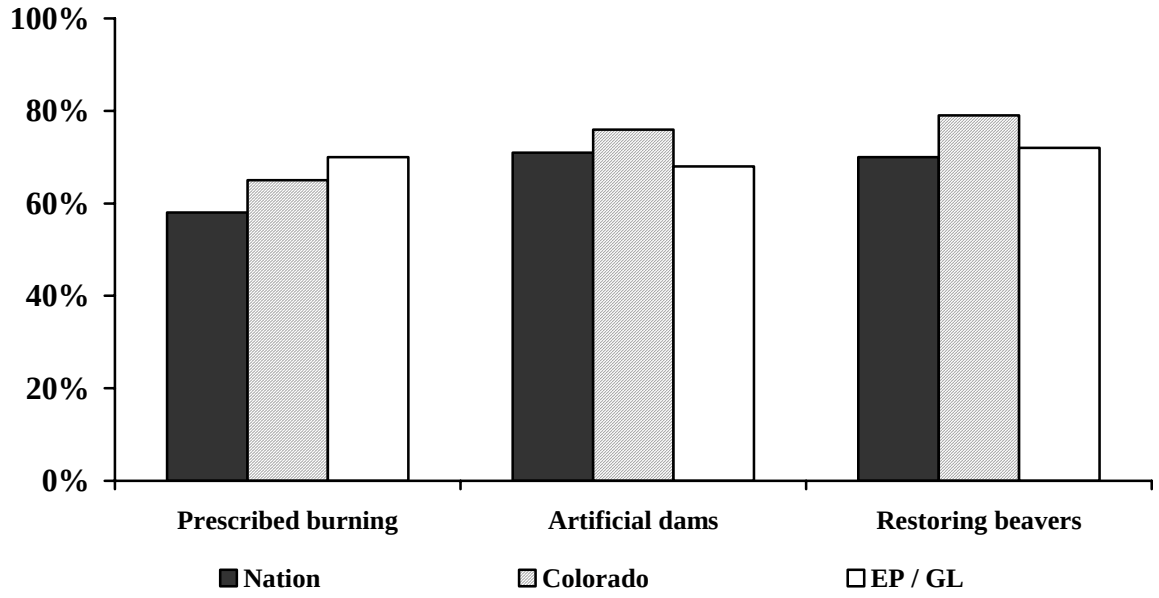
Methods to reduce elk numbers outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 158 and 160 for national residents, between 232 and 233 for Colorado residents, and between 297 and 298 for Estes Park / Grand Lake residents.
3. Chi values: Perm contraception, $\chi^2 = 36.27$, $p < .001$; Temp contraception, $\chi^2 = 12.52$, sig. = .01; Change hunting regs, $\chi^2 = 2.78$, sig. = .60.

Figure 21a. Acceptability of Management Actions that Reduce Elk Numbers outside RMNP, Resident Strata.

Habitat improvements outside RMNP



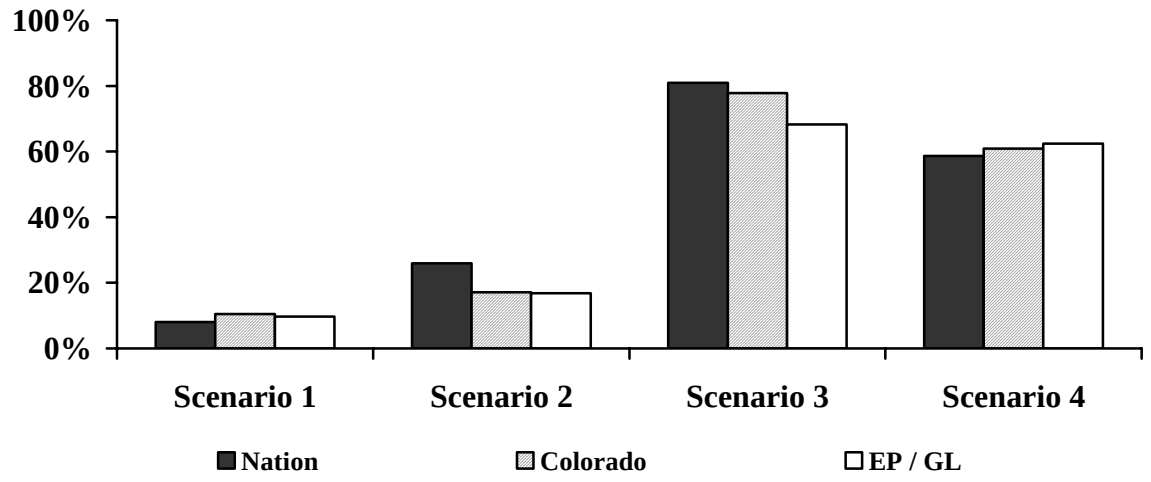
1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 157 and 159 for national residents, between 227 and 230 for Colorado residents, and between 292 and 296 for Estes Park / Grand Lake residents.
3. Chi values: Burning, $\chi^2 = 17.47$, sig. = .002; Dams, $\chi^2 = 8.86$, sig. = .07; Beavers, $\chi^2 = 7.33$, sig. = .12.

Figure 22a. Acceptability of Habitat Improvement Management Actions outside RMNP, Resident Strata.

APPENDIX B—RESPONSES TO KEY QUESTIONS WEIGHTED BY AGE & SEX

Please note: the visitor strata could not be weighted by age and sex because population values were not available for these two strata.

Acceptability of hypothetical future scenarios



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 138 and 139 for national residents, between 214 and 221 for Colorado residents, and between 275 and 278 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Scenario 1, $\chi^2 = .83$, sig. = .93; Scenario 2, $\chi^2 = .12$, sig. = .06; Scenario 3, $\chi^2 = 20.81$, $p < .001$; Scenario 4, $\chi^2 = 8.72$, sig. = .07.

1b. Acceptability of Hypothetical Future Scenarios of Elk and Vegetation in RMNP

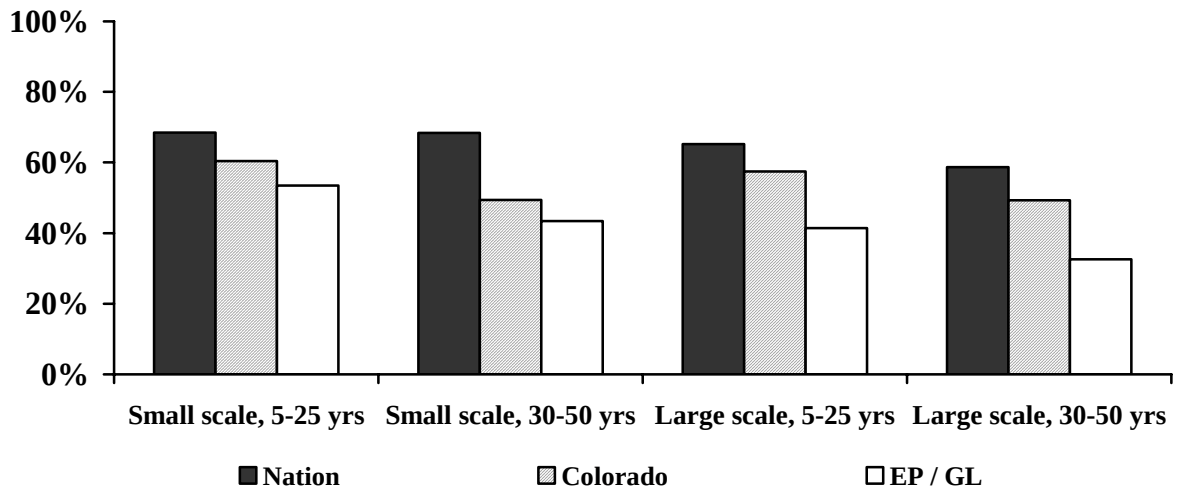
Table1b. Most Preferred and Most Opposed Management Scenario.[1]

	Most preferred scenario				Most opposed scenario			
Strata	1	2	3	4	1	2	3	4
National	1.0	6.1	63.5	29.4	81.8	1.1	.8	16.3
Colorado	3.2	5.8	52.6	38.1	78.3	1.2	1.4	19.1
Estes Park / Grand Lake	1.5	9.0	51.4	38.1	75.8	.8	.2	23.3

1. Data weighted for age and sex.
2. n = 138 and 102, respectively, for national residents, n = 216 and 159, respectively, for Colorado residents, n = 274 and 225, respectively, for Estes Park / Grand Lake residents.

Acceptability of management actions *in* RMNP

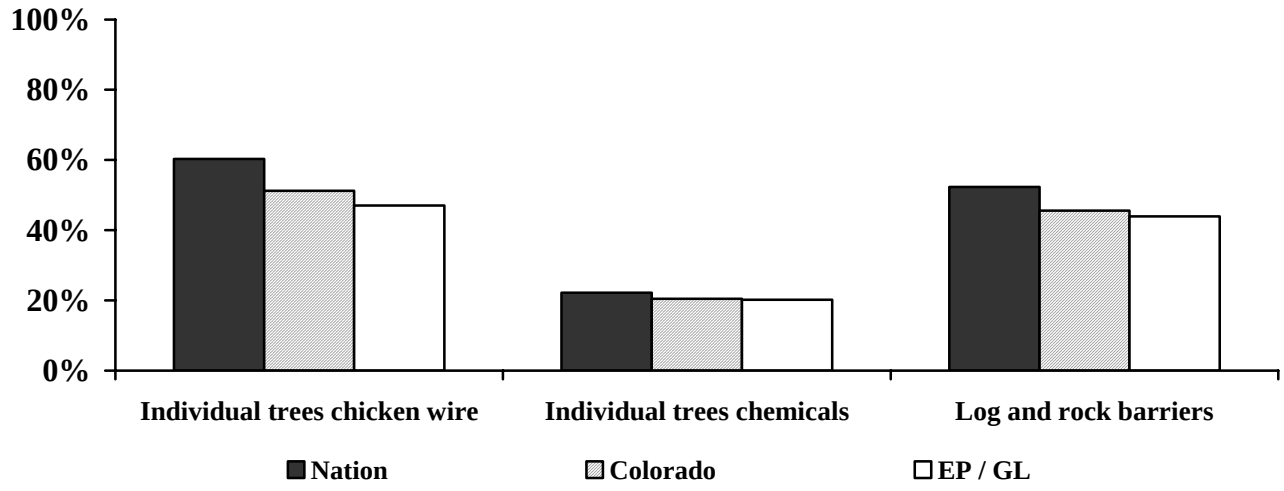
Fencing in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 136 and 138 for national residents, between 219 and 223 for Colorado residents, and between 270 and 274 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Small-scale, 5-25, $\chi^2 = 20.51$, $p < .001$; Small-scale, 30-50, $\chi^2 = 32.91$, $p < .001$; Large-scale, 5-25, $\chi^2 = 34.70$, $p < .001$; Large-scale 30-50, $\chi^2 = .24$, $p < .001$.

2b. Acceptability of Fencing Management Actions in RMNP

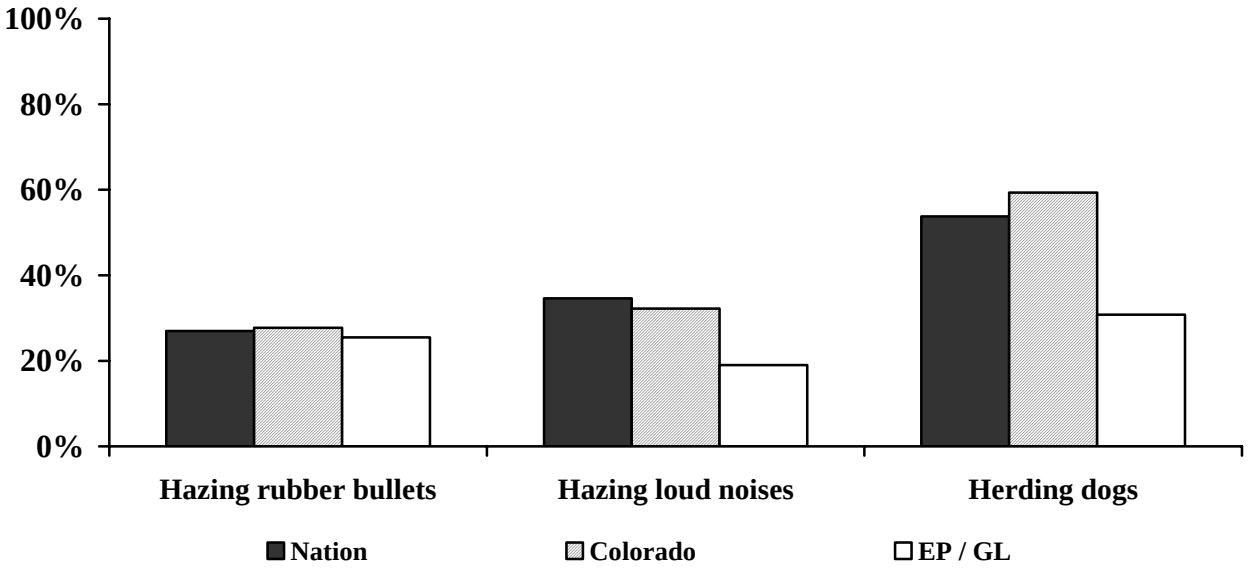
Resource protection in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 140 and 142 for national residents, n = 231 for Colorado residents, and between 282 and 284 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Chicken wire, $\chi^2 = 13.51$, sig. = .009; Chemicals, $\chi^2 = 7.62$, sig. = .11; Barriers, $\chi^2 = 7.90$, sig. = .10.

3b. Acceptability of Resource Protection Management Activities in RMNP

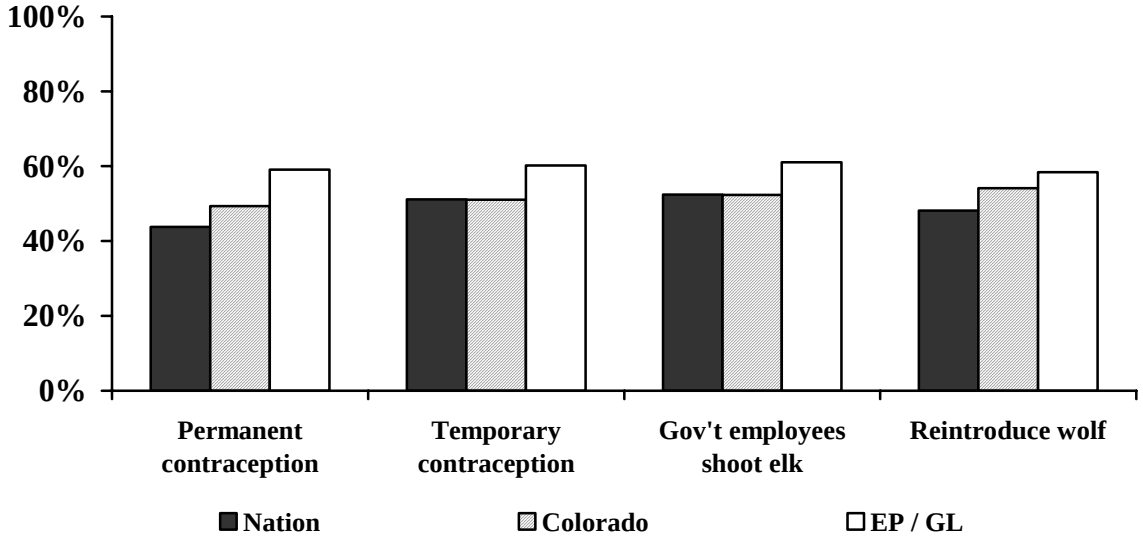
Hazing techniques in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 1537and 142 for national residents, between 230 and 231 for Colorado residents, and between 280 and 286 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Hazing with bullets, $\chi^2 = 2.40$, sig. = .66; Hazing with noise, $\chi^2 = 25.82$, $p < .001$; Herding dogs, $\chi^2 = 60.14$, $p < .001$.

4b. Acceptability of Hazing Techniques in RMNP

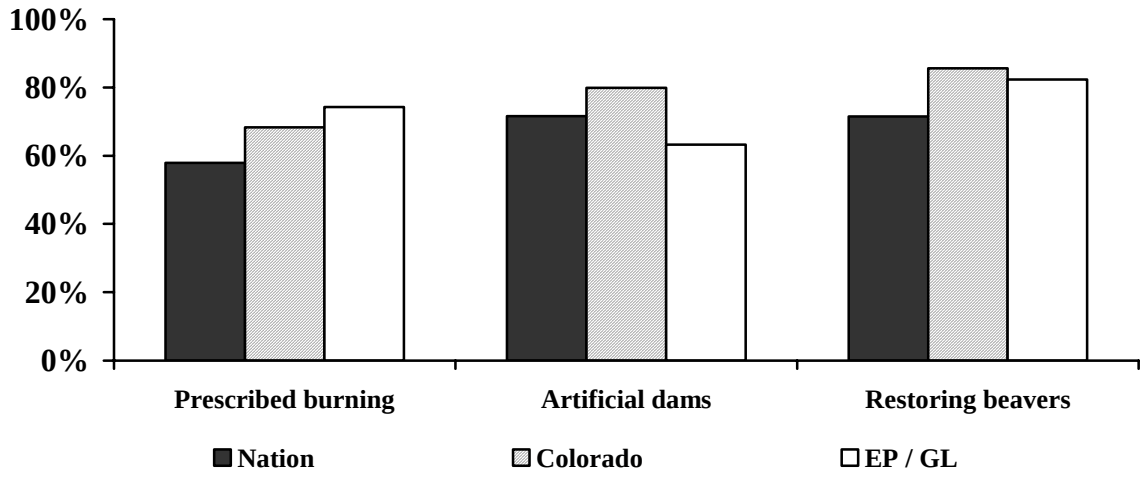
Methods to reduce elk numbers in RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 139 and 142 for national residents, between 230 and 231 for Colorado residents, and between 279 and 284 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Perm contraception, $\chi^2 = 10.57$, sig. = .03; Temp contraception, $\chi^2 = 12.38$, sig. = .02; Shoot elk, $\chi^2 = 11.16$, sig. = .03; Reintroduce wolf, $\chi^2 = 4.92$, sig. = .30.

5b. Acceptability of Management Actions that Reduce Elk Numbers in RMNP

Habitat improvements in RMNP

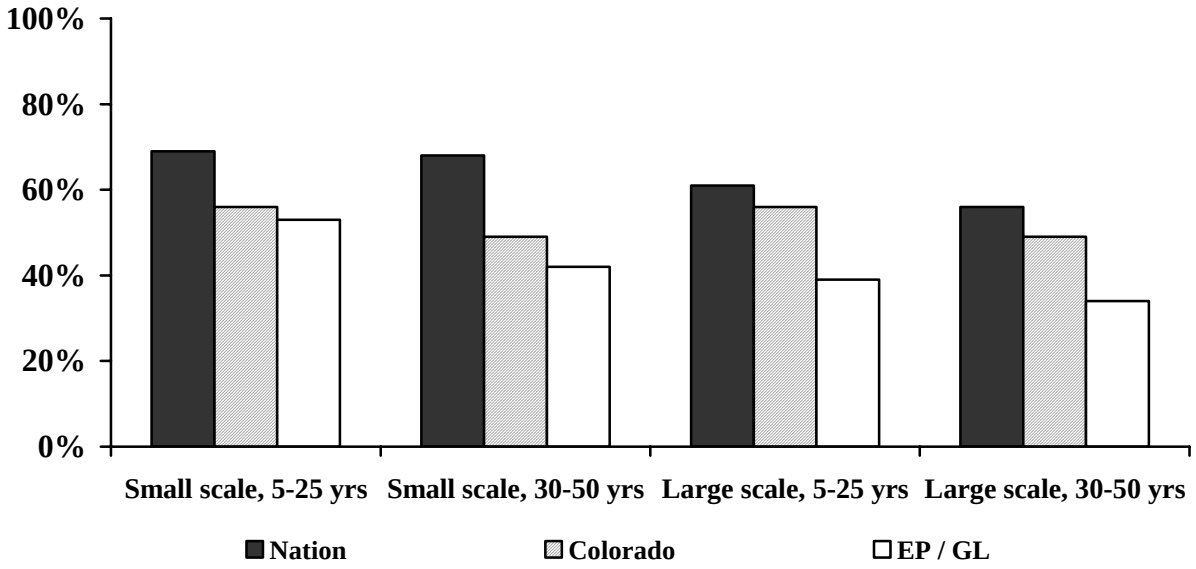


1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 158 and 161 for national residents, between 230 and 234 for Colorado residents, and between 295 and 296 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Burning, $\chi^2 = 20.94$, $p < .001$; Dams, $\chi^2 = 29.71$, $p < .001$; Beavers, $\chi^2 = 14.34$, sig. = .01.

6b. Acceptability of Habitat Improvement Management Actions in RMNP

Acceptability of management actions *outside* RMNP

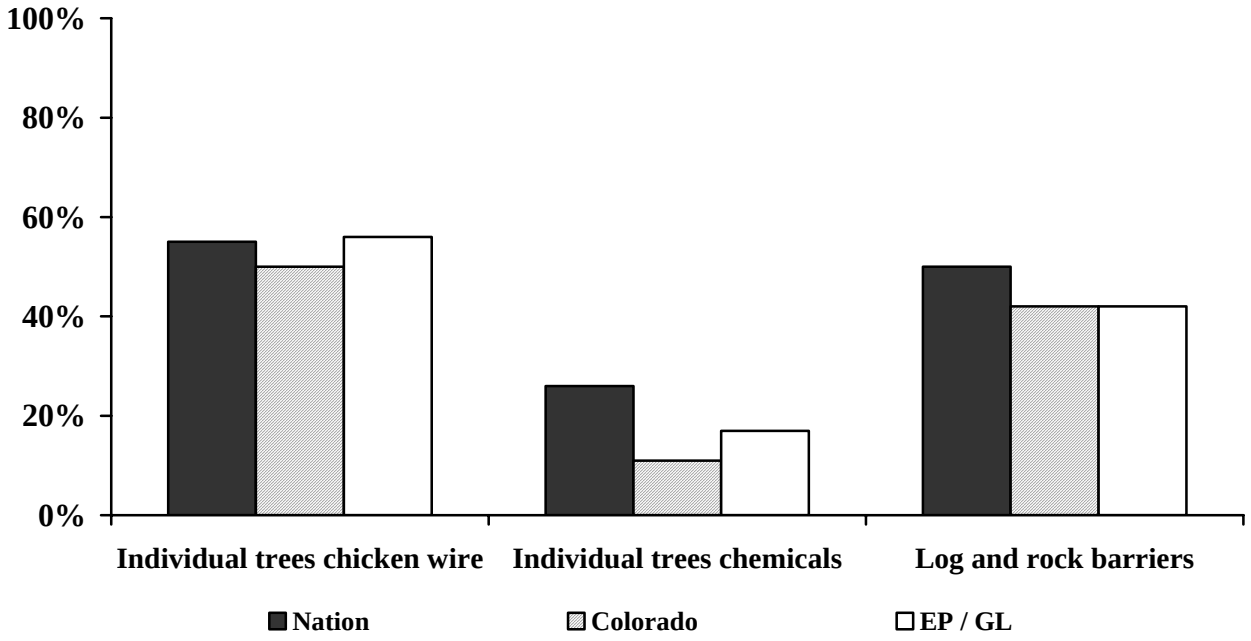
Fencing outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 149 and 152 for national residents, between 217 and 222 for Colorado residents, and between 276 and 284 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Small-scale, 5-25, $\chi^2 = 15.17$, sig. = .004; Small-scale, 30-50, $\chi^2 = 31.25$, $p < .001$; Large-scale, 5-25, $\chi^2 = 31.02$, $p < .001$; Large-scale 30-50, $\chi^2 = 35.22$, $p < .001$.

7b. Acceptability of Fencing Management Actions outside RMNP

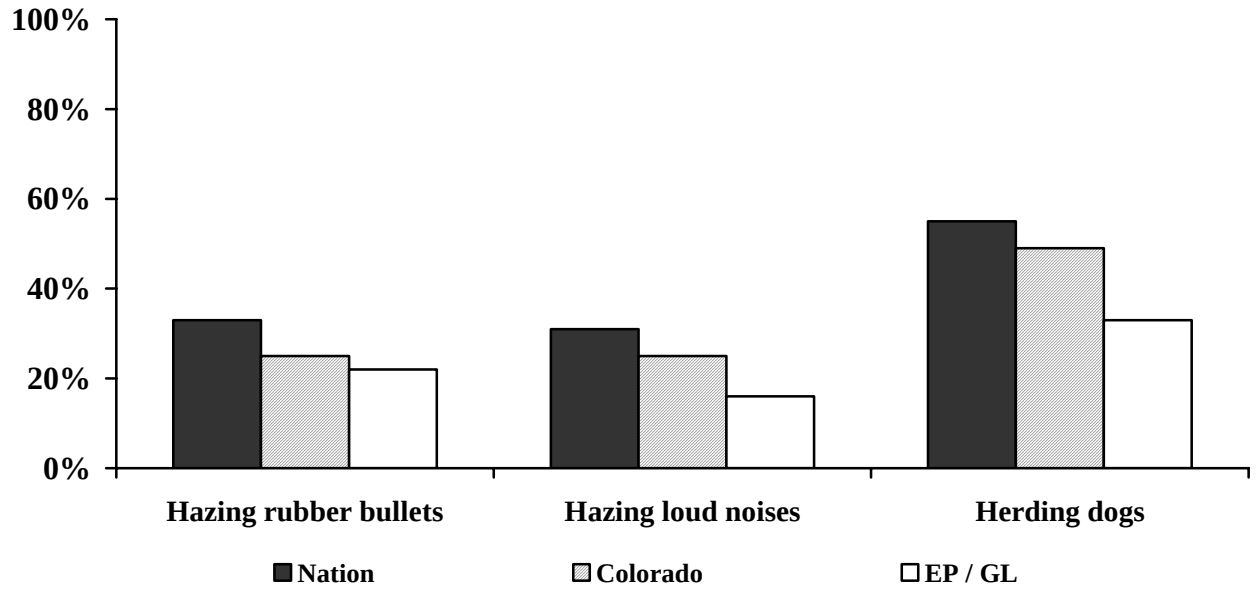
Resource protection outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 157 and 159 for national residents, between 228 and 231 for Colorado residents, and between 293 and 298 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Chicken wire, $\chi^2 = 12.45$, sig. = .01; Chemicals, $\chi^2 = 20.77$, $p < .001$; Barriers, $\chi^2 = 8.89$, sig. = .06.

8b. Acceptability of Resource Protection Management Actions outside RMNP

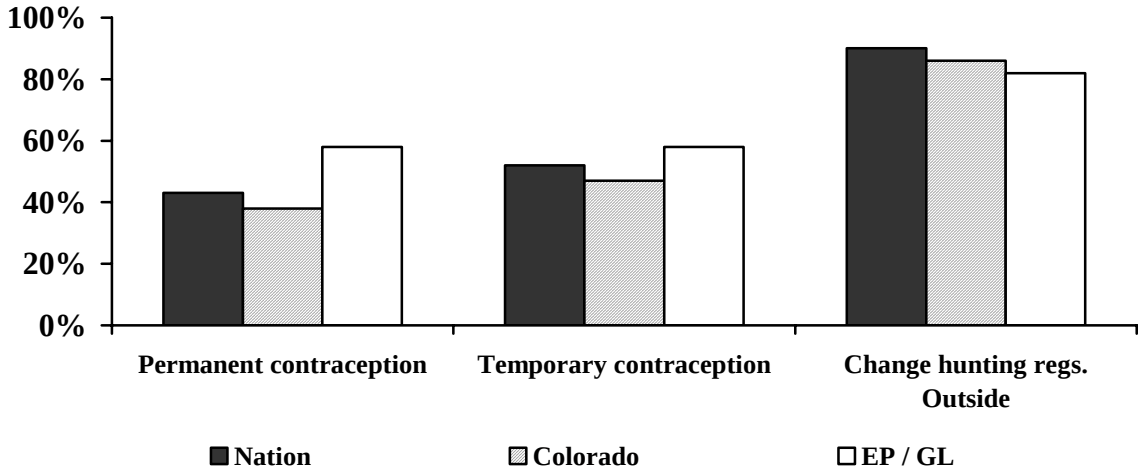
Hazing techniques outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 156 and 158 for national residents, between 228 and 231 for Colorado residents, and between 293 and 298 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Hazing with bullets, $\chi^2 = 6.23$, sig. = .18; Hazing with noise, $\chi^2 = 22.78$, $p < .001$; Herding dogs, $\chi^2 = 29.59$, $p < .001$.

9b. Acceptability of Hazing Techniques outside RMNP

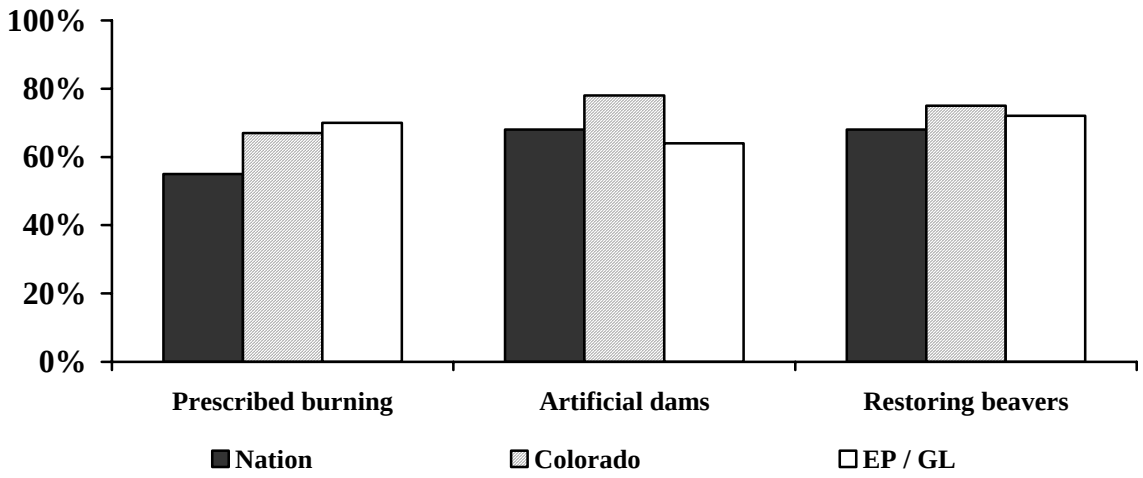
Methods to reduce elk numbers outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 158 and 160 for national residents, between 232 and 233 for Colorado residents, and between 297 and 298 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Perm contraception, $\chi^2 = 24.68$, $p < .001$; Temp contraception, $\chi^2 = 10.35$, sig. = .04; Change hunting regs, $\chi^2 = 7.05$, sig. = .13.

10b. Acceptability of Management Actions that Reduce Elk Numbers outside RMNP

Habitat improvements outside RMNP



1. % of respondents rating each management action as slightly, moderately, or highly acceptable.
2. n's range between 157 and 159 for national residents, between 227 and 230 for Colorado residents, and between 292 and 296 for Estes Park / Grand Lake residents.
3. Data weighted for age and sex.
4. Chi values: Burning, $\chi^2 = 24.94$, $p < .001$; Dams, $\chi^2 = 19.08$, sig. = .001; Beavers, $\chi^2 = 6.83$, sig. = .15.

11b. Acceptability of Habitat Improvement Management Actions outside RMNP

APPENDIX C—SURVEY BOOKLET

Public Preferences for Elk and Vegetation Management in Rocky Mountain National Park, Colorado

A cooperative study conducted by:

INSTRUCTIONS

This survey consists of two documents, the enclosed poster and this instruction / answer booklet. The poster provides information to be used in answering the questions in the booklet. Your name and address will not be associated with your responses and will remain strictly confidential.

There are three steps to complete this survey.

Step 1. Read through the information presented on the enclosed poster.

Step 2. Answer the questions on pages 3 through 11 in this booklet.

Step 3. Return the completed question / answer booklet in the addressed, postage paid envelope.

STEP 2: After reading through the poster, answer the following questions

How acceptable would you find it if the future conditions of Rocky Mountain National Park (RMNP) resembled **Scenario 1** (the top row of the poster)? (*Please circle one*)

Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
1.4	3.6	4.7	2.3	6.7	20.3	60.9

What are some of the reasons for your rating of Scenario 1?

_____

How acceptable would you find it if the future conditions of RMNP resembled **Scenario 2** (the 2nd row of the poster)? (*Please circle one*)

Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
4.5	7.3	7.9	4.6	15.7	28.4	31.7

What are some of the reasons for your rating of Scenario 2?

_____

How acceptable would you find it if the future conditions of RMNP resembled **Scenario 3** (the 3rd row of the poster)? (*Please circle one*)

Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
31.3	27.1	15.6	3.4	7.5	9.2	6.0

What are some of the reasons for your rating of Scenario 3?

_____

How acceptable would you find it if the future conditions of RMNP resembled **Scenario 4** (the 4th row of the poster)? (*Please circle one*)

Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
30.4	17.4	12.6	5.2	8.1	9.6	16.7

What are some of the reasons for your rating of Scenario 4?

_____

Of all the four scenarios of future conditions presented on the poster which one would you most prefer as future conditions in RMNP? (*Please check the scenario you most prefer*.)

_2.3_ Scenario 1 _8.2_ Scenario 2 _54.1_ Scenario 3 _35.4_ Scenario 4

Which would you most oppose?

Specific Methods Possible for Elk and Vegetation Management in RMNP and Surrounding Areas

In this section we ask you about methods that have been identified as possible actions for elk and vegetation management in RMNP and/or outside the Park (defined as the area surrounding RMNP such as the nearby towns of Estes Park and Grand Lake and surrounding U.S. Forest Service land). While most of these methods are currently not used in, or outside, RMNP, some have been used in other areas, and the feasibility of others has been researched. Some techniques may need to be applied together in order to be effective.

Method 1: Fencing areas of vegetation to protect it from browsing by elk.

- There are varying degrees of the amount of aspen and willow that could be fenced:
  - a small-scale application – small patches of fencing dispersed on the winter elk concentration area, and visible in some areas, **or**
  - a large-scale application – large sections of fencing throughout the winter elk concentration area and visible in many areas.
- There are varying lengths of time in which the fencing could be applied:
  - short-term application – fences in place for 5-25 years to allow new plants to become established, **or**
  - long-term application – fences in place for 30-50 years or more to provide protection of new plants after they become established.

How acceptable is the use of fencing to protect vegetation in each of the following situations?

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
Small-scale, 5-25 year application							
Inside RMNP?	19.9	24.4	18.5	4.0	6.3	8.5	18.4
Areas outside RMNP?	21.8	24.1	15.6	7.2	7.5	7.8	16.1
Small-scale, 30-50 year application							
Inside RMNP?	13.7	20.0	19.0	6.0	8.9	10.3	22.1
Areas outside RMNP?	15.3	20.9	16.6	9.4	9.3	9.0	19.5
Large-scale, 5-25 year application							
Inside RMNP?	13.5	17.7	18.6	6.2	9.1	11.0	23.8
Areas outside RMNP?	15.2	18.4	17.3	8.8	10.2	10.2	19.9
Large-scale, 30-50 year application							
Inside RMNP?	11.7	13.3	15.4	7.4	10.0	11.7	30.4
Areas outside RMNP?	13.5	13.9	16.3	9.0	10.3	11.7	25.2

Method 2: Shooting elk with rubber bullets or rubber buckshot to move them away from sensitive vegetation areas.

- Would require frequent, repeated application over a long time period

How acceptable is the use of shooting elk with rubber bullets or rubber buckshot to move them away from vegetation in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	7.7	8.9	12.4	6.6	8.9	15.9	39.6
Areas outside RMNP?	8.6	9.6	12.6	7.5	9.2	13.2	39.2

Method 3: Restoring beavers to increase water available to support willow growth.

- Could require significant manipulation, including providing beaver with supplemental food and taking measures to protect the new willow

How acceptable is restoring beavers to increase the amount of water available to support willow growth in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	35.1	28.5	18.3	5.3	3.6	3.9	5.5
Areas outside RMNP?	27.6	28.1	19.6	9.0	4.8	4.4	6.6

Method 4: Protecting individual trees or shrubs from elk browsing with mechanical protection such as chicken wire.

- Would be effective at protecting individual trees or shrubs in limited locations

How acceptable is protecting individual trees or shrubs from elk browsing with mechanical protection in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	16.3	18.4	18.9	7.7	7.1	10.5	21.2
Areas outside RMNP?	18.4	19.8	15.9	9.6	7.8	9.6	18.9

Method 5: Using prescribed burning to stimulate vegetation growth.

- Various methods would need to be employed to protect new vegetation growth from elk browsing for periods of 10-30 years

How acceptable is using prescribed burning to stimulate vegetation growth in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	21.3	30.3	20.6	5.3	6.2	5.8	10.4
Areas outside RMNP?	20.1	29.2	19.4	7.3	5.8	6.8	11.4

Method 6: Using herding dogs (such as border collies) to move elk away from sensitive vegetation areas.

- Would require frequent, repeated application over a long time period

How acceptable is using herding dogs (such as border collies) to move elk away from sensitive vegetation areas in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	14.3	16.3	14.7	7.8	9.2	10.5	27.2
Areas outside RMNP?	15.0	17.1	14.8	8.5	8.5	10.2	25.9

Method 7: Protecting aspen and willow from elk browsing by creating barriers to the aspen and willow with logs and rocks.

- Barriers would need to be large and extensive to keep elk from the willow and aspen

How acceptable is protecting aspen and willow from elk browsing by creating log and rock barriers in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	12.1	15.4	16.8	8.3	8.7	14.8	23.8
Areas outside RMNP?	12.5	15.8	15.5	10.6	8.6	13.8	23.2

Method 8: Reducing elk numbers by applying a permanent contraceptive to elk.

- A permanent hormonal contraceptive would be administered to a targeted number of elk
- A large number of animals would need to be handled, treated, and visibly marked with a small ear tag initially, and a few animals handled, treated and marked with a small ear tag periodically after the initial application
- Treated animals could not have offspring in the future

How acceptable is it to reduce elk numbers by applying a permanent contraceptive to elk in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	22.0	19.0	15.0	4.4	5.7	9.1	24.8
Areas outside RMNP?	20.5	18.3	14.3	5.8	5.7	8.9	26.5

Method 9: Protecting individual trees or shrubs from elk browsing by using chemical repellents.

- Would require frequent, repeated application of repellents to individual trees or shrubs
- Would be applied to limited areas and effects on other species would need to be monitored

How acceptable is protecting individual trees or shrubs from elk browsing by using chemical repellants in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	3.6	8.3	11.5	6.6	12.0	17.7	40.4
Areas outside RMNP?	4.3	7.8	11.0	7.5	12.5	17.3	39.6

Method 10: Reducing elk numbers by applying a temporary contraceptive to elk.

- A temporary hormonal contraceptive would be administered to a targeted number of elk
- A large number of animals would need to be handled, treated, and marked with a small ear tag each year
- Treated elk could have offspring in the future

How acceptable is reducing elk numbers by applying a temporary contraceptive to elk in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	21.4	19.9	16.4	5.6	7.1	9.3	20.3
Areas outside RMNP?	20.9	18.4	16.2	7.0	6.6	10.0	21.0

Method 11: Reducing elk numbers using government employees to shoot a targeted number of elk.

- A moderate to large number of animals would need to be culled initially, with small to moderate periodic reductions

How acceptable is reducing elk numbers by using government employees to shoot targeted number of elk in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	22.5	18.5	15.7	3.3	6.7	8.8	24.6

Method 12: Using loud noises to move elk away from sensitive vegetation.

- Would require frequent, repeated application over a long time period

How acceptable is using loud noises to move elk away from sensitive vegetation in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	3.9	6.4	13.0	7.9	10.5	18.3	40.1
Areas outside RMNP?	4.1	7.1	12.1	9.8	10.5	17.0	39.5

Method 13: Constructing artificial dams in wetland areas to increase water available to support willow growth.

- Specific willow stands could be targeted to focus on areas needing regeneration and avoid flooding risks
- Various methods would be needed to be used to protect willow from elk browsing

How acceptable is constructing artificial dams to increase water availability to support willow growth in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	22.3	30.4	20.9	5.7	6.4	5.6	8.7
Areas outside RMNP?	21.7	30.3	19.7	9.0	6.3	5.1	7.8

Method 14: Changing the regulations of elk hunting in areas *outside* RMNP where hunting is currently allowed in order to reduce elk numbers in the RMNP area.

- Visibility of hunting activity to RMNP visitors would be minimal
- Could include a combination of increased licenses, different season dates, and a change in the number of cow licenses issued relative to bull licenses

How acceptable is changing the regulations of elk hunting in order to reduce elk numbers in the RMNP area in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
Areas outside RMNP?	51.7	23.3	11.4	2.0	2.3	2.7	6.5

Method 15: Reintroducing wolves to decrease elk numbers and change elk distribution in RMNP.

- Wolves will most likely spread to areas outside of RMNP
- The Colorado Wildlife Commission currently prohibits wolf reintroduction on the state lands outside of RMNP

How acceptable is reintroducing wolves to decrease elk numbers and change elk distribution in:

	Highly acceptable	Moderately acceptable	Slightly acceptable	Neither	Slightly unacceptable	Moderately unacceptable	Highly unacceptable
RMNP?	22.3	17.8	14.0	5.2	7.5	10.2	23.0

Are there any methods not listed above that you think could be used for elk and vegetation management ***inside RMNP***?

_____

_____

Are there any methods not listed above that you think could be used for elk and vegetation management ***outside RMNP***?

_____

_____

General Wildlife Questions

This section consists of two sets of questions. The first set of questions asks about your level of agreement with statements regarding elk and vegetation management in RMNP. The second set of questions asks about how you feel about wildlife in general.

For each of the following statements regarding elk and vegetation management in RMNP, *please circle the number corresponding to **your** level of agreement*.

	Strongly agree	Moderately agree	Slightly agree	Neither	Slightly disagree	Moderately disagree	Strongly disagree
It is important to maximize elk viewing, even if it results in a loss of vegetation on the elk winter concentration area	2.6	6.2	10.3	5.4	14.6	21.4	39.5
If natural conditions dictate there should be fewer elk in the Park, the elk herd should be reduced	53.4	25.4	12.8	2.6	1.7	1.7	2.5
It is acceptable to reduce the size of the elk herd to ensure that aspen and willow regenerate	45.2	26.9	16.0	2.9	2.8	2.4	3.7
I would visit RMNP less often if seeing / hearing elk was less likely	8.1	7.9	7.5	18.1	6.5	14.3	37.5

The next series of questions asks how you feel about wildlife in general. For each statement, *please circle the number corresponding to **your** level of agreement with each statement*.

	Strongly agree	Moderately agree	Slightly agree	Neither	Slightly disagree	Moderately disagree	Strongly disagree
Humans should manage wild animal populations so that humans benefit	13.9	17.7	11.7	12.7	9.3	14.9	19.8
Animals should have rights similar to the rights of humans	7.1	11.3	11.9	10.2	11.5	14.5	33.6
It is important for humans to manage the populations of wild animals	32.2	30.7	19.0	4.9	4.6	4.3	4.2
I enjoy watching wildlife when I take a trip outdoors	77.7	16.2	3.6	1.6	0.1	0.2	0.6
It is important to maintain wildlife so that future generations can enjoy them	80.9	12.8	3.8	1.4	0.0	0.4	0.6
Hunting is cruel and inhumane to the animals	6.0	4.3	8.2	9.5	8.1	16.3	47.7

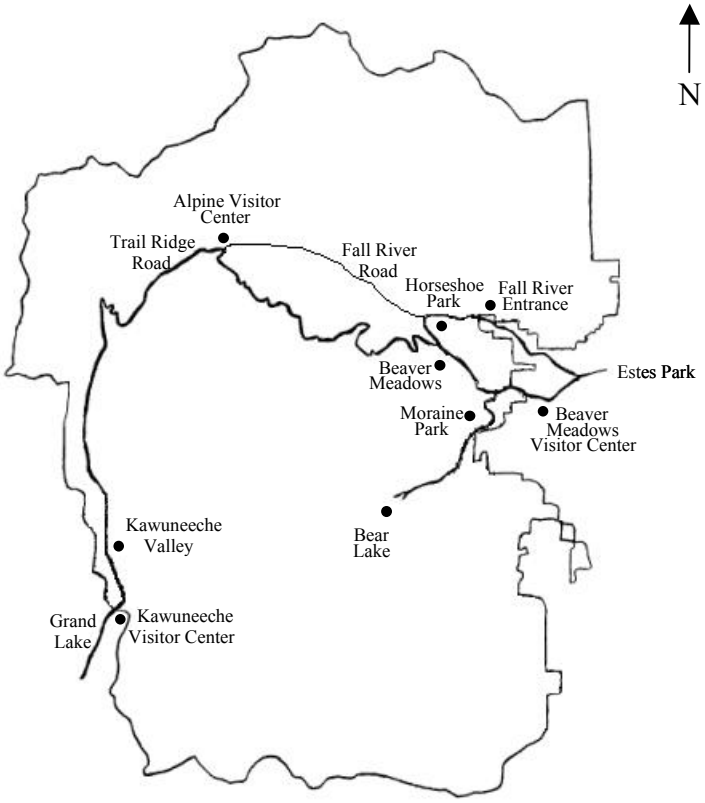
General information about your trips to Rocky Mountain National Park

Approximately how many times have you visited Rocky Mountain National Park in the previous 12 months?

____ time(s) in the last 12 months ____ I have never visited RMNP

If you have not visited Rocky Mountain National Park in the previous 12 months, or have never visited RMNP, please skip to page 11

Please circle the areas shown on the map that you visited on your most recent trip to RMNP.



Please list other areas not shown on the map that you visited on your most recent trip to RMNP.

_____ _____

_____ _____

_____ _____

On your most recent trip, how important was viewing wildlife in RMNP compared to the other aspects of your visit? (*Please check one*)

___ Much less important ___ Less important ___ Equally important ___ More important ___ Much more important ___ Not sure

___ Viewing wildlife was not at all important to my trip to RMNP

On your most recent trip, what activities did you participate in while visiting RMNP? (*check all that apply*)

___ Hiking ___ Camping ___ Climbing ___ Wildlife photography ___ Snowshoeing
___ Biking ___ Fishing ___ Auto touring ___ Wildlife viewing ___ Skiing
___ Other *(please specify)*_____

Below are 4 types of people who participate in wildlife viewing. Please read the description of each type of wildlife viewer and then answer the question below.

Type 1 is a person who is highly interested in wildlife viewing. They take several wildlife viewing trips throughout the year and they enjoy opportunities to study wildlife and its behavior and opportunities to teach and lead others.

Type 2 is also very active and interested in wildlife. However, what they value most highly is the opportunity to photograph, paint or sketch wildlife. These people often have a high investment in equipment such as camera gear.

Type 3 is a person with a general interest in seeing and learning more about wildlife. They take trips to see wildlife sporadically throughout the year and do so to have a change of pace, to get out with friends or family or just to see new scenery.

Type 4 is a person who has a slight level of interest in trips specifically to view wildlife. Only occasionally do they take wildlife viewing trips. The primary means by which they enjoy wildlife is when it is associated with other types of activities such as auto driving, camping, walking, or fishing.

Which type of wildlife viewer best describes you? (*Please check one*)

___ Type 1 ___ Type 2 ___ Type 3 ___ Type 4 ___ None of these

Demographics

The following section asks about you. This information will be used only for the purposes of comparing responses between groups. Remember, all of the information will remain confidential.

What is your age? _____ years old

What is your gender? ____ Male ____ Female

If a resident of the Estes Park, CO or Grand Lake, CO area, are you a permanent or seasonal resident?

____ Permanent ____ Seasonal ____ Not a resident of Estes Park or Grand Lake

STEP 3

Please return the completed question / answer booklet in the enclosed addressed / postage paid envelope.

Thank you very much for your time!

APPENDIX D—INDIVIDUAL n'S FOR MANAGEMENT ACTIONS BY QUESTION AND STRATA

Individual n's for Management Actions *in* RMNP

Management actions[1]	Strata				
	National	Colorado	Estes Park / Grand Lake	Colorado Visitors	Non-resident Visitors
Fencing Management Actions					
Small-scale, 5-25 yrs	151	217	281	364	388
Small-scale, 30-50 yrs	144	212	276	357	388
Large-scale, 5-25 yrs	147	211	275	356	385
Large-scale, 30-50 yrs	148	213	279	358	387
Resource Protection Management Actions					
Individual trees chicken wire	158	228	291	367	403
Individual trees chemicals	154	228	292	367	402
Log and rock barriers	159	226	293	368	401
Hazing Techniques					
Hazing with rubber bullets	154	227	290	363	402
Hazing with loud noises	158	228	292	362	400
Hazing using herding dogs	158	228	293	367	401
Elk Reduction Management Actions					
Permanent contraception	159	228	293	367	402
Temporary contraception	157	228	293	365	403
Culling with government employees	157	228	288	365	401
Reintroducing wolves	159	228	291	370	404
Habitat Improvement Management Actions					
Prescribed burning	159	226	290	367	400
Artificial dams	155	228	293	367	402
Restoring beavers	157	227	290	366	402

[1] Data weighted by "Humans should manage wild animal populations so that humans benefit".

Individual n's for Management Actions *outside* RMNP

Management actions[1]	Strata				
	National	Colorado	Estes Park / Grand Lake	Colorado Visitors	Non-resident Visitors
Fencing Management Actions					
Small-scale, 5-25 yrs	150	214	277	360	387
Small-scale, 30-50 yrs	146	209	272	355	385
Large-scale, 5-25 yrs	149	211	272	355	385
Large-scale, 30-50 yrs	149	211	280	355	388
Resource Protection Management Actions					
Individual trees chicken wire	157	219	288	362	400
Individual trees chemicals	155	223	292	362	400
Log and rock barriers	157	223	293	362	400
Hazing Techniques					
Hazing with rubber bullets	155	221	289	356	401
Hazing with loud noises	155	220	291	361	398
Hazing using herding dogs	156	222	292	361	399
Elk reduction management actions					
Permanent contraception	157	224	293	362	400
Temporary contraception	156	224	293	359	402
Changing hunting regulations outside RMNP	159	229	293	369	404
Habitat improvement management actions					
Prescribed burning	157	219	289	360	395
Artificial dams	157	223	293	362	400
Restoring beavers	157	221	286	359	400

[1] Data weighted by "Humans should manage wild animal populations so that humans benefit".

APPENDIX E—SAMPLING BLOCKS

Sample days for CSU-RMNP Public Preference for Elk and Vegetation Management Study
Sampling period = August 1 - September 30
40 days selected

Date	Entrance / Time	Date	Entrance / Time
1-Aug	FR, M	1-Sep	FR, E[1]
2-Aug	FR, E	2-Sep	FR, E
3-Aug	GL, M	3-Sep	FR, E
4-Aug	FR, E	4-Sep	X
5-Aug	FR, E	5-Sep	X
6-Aug	X	6-Sep	X
7-Aug	BM, M	7-Sep	FR, E
8-Aug	FR, E	8-Sep	FR, E
9-Aug	BM, M	9-Sep	X
10-Aug	BM, E	10-Sep	GL, E
11-Aug	GL, E	11-Sep	X
12-Aug	GL, E	12-Sep	GL, E
13-Aug	X	13-Sep	FR, E
14-Aug	FR, E	14-Sep	X
15-Aug	X	15-Sep	X
16-Aug	X	16-Sep	FR, E
17-Aug	GL, E	17-Sep	BM, E
18-Aug	FR, M	18-Sep	X
19-Aug	X	19-Sep	GL, E
20-Aug	GL, M	20-Sep	GL, E
21-Aug	BM, M	21-Sep	X
22-Aug	X	22-Sep	BM, E
23-Aug	GL, E	23-Sep	FR, E
24-Aug	BM, M	24-Sep	GL, E
25-Aug	X	25-Sep	BM, E
26-Aug	X	26-Sep	BM, E
27-Aug	GL, E	27-Sep	X
28-Aug	BM, M	28-Sep	X
29-Aug	FR, M	29-Sep	FR, E
30-Aug	X	30-Sep	X
31-Aug	BM, E		

KEY:
FR = Fall River
BM = Beaver Meadows
GL = Grand Lake

X = Not selected
M = Morning, 10:00 a.m to 3:00 p.m.
E = evening, 3:00 p.m to 8 p.m.

1. Please note that in September only evening blocks were assigned